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TO CORRESPONDENTS.

**CARBON** writes: "I can bear testimony to my brother manager's remarks in your last about Retort Carbon. For years I have sold mine at the same price as Newcastle coke. Our foundry people seek it up as soon as they know that we have any. They tell me it makes the metal run freer and quicker. I gave them the first lot for a trial; since then they always buy it."

THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 1, 1878.

Circular to Gas Companies.

THE threatened prosecution of the Chartered Gas Company by the Metropolitan Board of Works, for a deficiency of illuminating power on a certain date, and an actual prosecution at Cardiff for a similar default, compel us to make some remarks on tests and testing for illuminating power. The cases vary a little, for while, in the instance of the Chartered Company, the deficiency complained of was about one and two-thirds of a candle, at Cardiff the default was only one-third of a candle. The case against the Cardiff Company broke down on a question of jurisdiction; but we shall refer to it further on. Passing on to the intended prosecution of the Chartered Company, we should be disposed to call in question the propriety of taking proceedings for a deficiency of even a candle and a half; but the Company may admit the default. We notice that in this case an appeal was made to the Chief Gas Examiner. Upon what principles this functionary arrives at a decision, on appeal respecting a deficiency of illuminating power, we do not know. In the case of impurities, the *corpora delicta*, in the shape of the solutions obtained, are bottled up, and remain for examination in case of dispute. But the light of other days cannot be bottled up, and the standard of comparison has gone with the consumed part of the candles, and thus the Chief Examiner is left hopelessly in the dark as to the cause of the defect—that is, so far as the testing-station can reveal it. On a visit to the works, he might, perhaps, learn that, by inadvertence a truckload of cannel was deficient, or that, by some mishap or other, atmospheric air had found its way into the mains—neither of them very good reasons for mitigating the substantial penalty fixed for deficiency of illuminating power under the Metropolitan Acts. This, however, must be said, the Acts provide that the penalty shall be

calculated upon all the gas made in the twenty-four hours, when it may be that the deficiency lasted only one or two hours. If the Company are to pay for the gas made during the whole of the day, it should be tested all through the twenty-four hours; but this is never done. Even now that no actual hours are prescribed for the testing, the examination of gas in the Metropolis cannot be said to be in a satisfactory state. We shall not go the length of saying, as some do, that the testing is a farce played at the joint expense of the Gas Companies and the rate-paying public; but we do say that, if the Gas Companies are to be prosecuted for small deficiencies of illuminating power, some alterations must be made in the arrangements which now obtain.

Returning to Cardiff, and the prosecution for a third of a candle, we may note the fact that four gentlemen of equal competence, operating at one time with that celebrated photometer at Fulham, arrived at greater divergencies in their determinations of the illuminating power of the same gas. It is an undoubted fact, that an allowance of, at least, one candle must be made for the several disturbing influences. Our readers know that we have always advocated the use of candles as the standard of comparison, and we retract nothing we have written on the subject. Still, we are willing to admit that candles have their defects. We have, in the vast majority of cases, found them to burn with great regularity; but, with a badly-made wick, the light given by the candle may, and, indeed, does, vary at every inch of its length. Thus a prosecution for a deficiency of one-third of a candle is worse than an absurdity. Even the most skilled Examiners—those whose whole time is occupied with the examination of gas—may be unconsciously misled; how much more so may this be the case with a country doctor, who has made but few tests in the course of his life, and has had no special training as a Gas Examiner. It is a misfortune for the Cardiff Gas Company that their Act prescribes the use of the old Argand burner. If Sugg's New "London" had been employed, we have no doubt that the gas would have afforded an illuminating power considerably above the standard. It may be worth their while to know that Mr. Sugg has a fifteen-hole burner, which will satisfy the requirements of their Act, while giving them all the advantages of the New "London." Probably the proceedings will not be resumed; but the Company should lose no time in providing the most modern appliances for gas-testing.

We insert to-day—we cannot say exactly with pleasure—what may be called the final appeal of Mr. R. H. Patterson. The statements he makes call for little remark, for the whole matter, we consider, has been sufficiently dealt with. We must make one exception, however, for his patent of 1873, though published in our columns, has never been remarked upon. We are glad to learn that the ammonia process described in this patent is in successful operation at the works of the South Metropolitan Company, and we should be pleased to hear of its adoption in many other works. On the general principles enunciated in his letter, we entirely agree with Mr. Patterson. Patentees undoubtedly suffer from the ignorance of the Judges who are required to adjudicate on their claims. We have had, in the course of our experience, to listen to judgments which clearly showed that the Judge had not the smallest conception of the nature of the case. This has been especially illustrated in the suits which involve the discussion of chemical points. In such cases we have always advocated the employment of expert assessors. The prejudices and conceit of the legal profession, however, stand in the way of such appointments, and thus it happens that gentlemen of great attainments, but with no special qualifications, are called upon to decide questions with regard to which they have no exact knowledge. Mr. Patterson, as an energetic writer for the daily press, may do some good for himself and his co-patentees if he will thoroughly ventilate this matter. We regret that the crowded state of our columns prevented us publishing his three days address in the House of Lords, but after the publication of the letter we print to-day we do not think he will suffer from the omission. The main points of the case, as presented to the Courts, were so fully noticed last week, that no further remarks are called for. Mr. Patterson has now his 1873 patent to work with, and we wish him all success.

The Corporation of Worcester are, as we have already informed our readers, hankering after the property of the Gas Company. They have been collecting statements of the price and quality of the gas supplied to one hundred and four towns, and they find that in some, gas is cheaper than in Worcester, and in many dearer, while differences exist in the illuminating power. But what they have not learnt is the varying circumstances and conditions which obtain in the several localities, and on which the price of gas must depend. Let the Corporation of Worcester get the works if they can, but let them well understand that they will



never be able to supply gas at a cheaper rate than that at which it might be furnished by the Company. The discussion in the Town Council has been postponed for a time, and we shall have to refer to the desired purchase again.

All we said recently about the Hastings Gas Company, and the price of gas in that town, is more than justified by the information which we have since received. The coal the Company use is landed at Whitstable, it is thence railed to Hastings Station, and from thence has to be carted to the works and trimmed. The *octroi* at Hastings is very high, and when the obligations of the Company to the town are considered, this tax should not be forgotten. As regards the question of the supply of gas to public lamps, we consistently advocate the adoption of the average meter system, which we hope will be followed at Hastings. Considering all things, we have every reason to believe that the price of gas in Hastings is perfectly fair, and we are surprised that intelligent people should object to so reasonable a charge.

The Radcliffe and Pilkington Local Board are raising a most unreasonable opposition to the Bill promoted by the Radcliffe and Pilkington Gas Company. They complain of the high price, bad quality, and insufficient supply, and now they seek to prevent the Company from obtaining powers which would enable them to remedy all the defects, and most probably to reduce the price. The Local Board have applied to the Central Authority for power to spend money in opposing the Bill, and have been, as a matter of course, referred to the provisions of the Municipal Corporations (Borough Funds) Act. They have accordingly resolved on calling a public meeting, to obtain sanction for the expenditure of money in opposing the Bill. Our voice may not be heard in Radcliffe, but, if it be, we strongly advise the ratepayers to keep their money in their pockets, and leave the Company, whose only object is, while, of course, earning some profit for themselves, to do the best for the consumers, and furnish an adequate and pure supply of gas.

To-day the Blackburn gas undertaking passes into the hands of the Corporation, and, much as we regret the transfer, we have no hesitation in saying that the terms obtained by the Shareholders have been fair and good, if not liberal. It is admitted that, as regards any profit to the Corporation, this must depend on the possible growth of the town, and the probable increase of consumption of gas. The growth of towns occupied by the cotton manufacture becomes more and more problematical every day. Bombay is becoming the centre of a cotton industry, which yearly increases in importance, and may eventually even compete with Manchester itself. Thus the prospects of the Corporation of Blackburn may not be so brilliant as their gas. Still, they have only acted in accordance with modern ideas, and the ratepayers must put up with the consequences. The Corporation have a hundred years to pay off the debt they have just incurred; but if the gas annuitants take our advice they will "commute, compound, and cut," with all possible speed.

An attempt has been made to apply the Burghs (Scotland) Gas Supply Act to North Berwick, but the inhabitants and the Commissioners were not in agreement; and at the town's meeting, held in accordance with the provisions of the Act, a poll was demanded, the result of which was favourable to its adoption. From some cause, however, said to be a legal blunder, the Provost has issued a notice to the effect that "the Magistrates and Town Council have resolved to abandon the measure." We may take it that the Council were fairly beaten by the partisans of the Gas Company, and now the question of purchase must necessarily remain in abeyance for three years. In the meantime, the Council may acquire wisdom, and be content to allow a commercial undertaking to pursue its course unimpeded by useless agitation.

By an extract from the *Melbourne Argus*, which will be found in another column, it will be seen that something like the most modern Metropolitan Gas Legislation has been adopted in one of our most distant Colonies. We mentioned a few weeks ago that the three Companies supplying Melbourne had resolved on amalgamation, subject to the approval of the Victorian Legislature. That sanction has now been obtained; but at some little sacrifice on the part of the Companies. The amalgamated Company are saddled with auction clauses and sliding scale, and they are limited to the initial price of 7s. 6d. per thousand for fourteen-candle gas, a sum exceptionally low for the Southern Colonies. The Company have also failed to obtain the extended limits they wished for; but enough remains to make the united undertaking a most substantial concern. The Company asked for a standard dividend of twelve and a half per cent., which is only reasonable for the Colony; but the Legislature granted only ten per cent., stipulating that any excess of profit over ten per cent. should be equally divided between the Company and the

Municipality. To obtain the twelve and a half per cent. the Company asked for, they will have to reduce the price of gas to five shillings. The day will soon come when a considerable extension of gas enterprise must take place in the Australian Colonies. New South Wales has sent to England some of the richest gas coal ever placed in a retort, and has in her dominions enough of different varieties to supply the whole Southern Hemisphere. Thus we may anticipate a good future for the amalgamated Melbourne Gas Companies. The Mother Country has occasionally borrowed hints from Colonial experiences, and this, of general amalgamation for the whole supply, may furnish one which may be usefully followed here. Melbourne, however, has a grievance. The Act passed by the Victorian Legislature does not compel a publication of the accounts of the Company; but this does not matter. Gas Companies have been accused of all sorts of rascalities; but every one who has been concerned in their management knows that in nine cases out of ten the accusations have been groundless.

We publish to-day an interesting account of the electrical apparatus devised by Mr. St. George Lane Fox for the simultaneous lighting and extinguishing of public lamps. Under ordinary circumstances, we have no doubt whatever of its efficiency, but we have a doubt as to what would happen if a heavy thunderstorm prevailed at the hour of lighting or extinguishing. This question set at rest, we could safely recommend the adoption of the apparatus to all Gas Companies and Local Authorities, and see with equanimity the disconsolate lamplighter and his family enter the workhouse in consequence of the march of science. We have, however, a strong suspicion that Mr. St. G. Lane Fox's invention will, like the electric candle, remain *in posse*, and the lamplighter will continue to enjoy a cheerful existence, except in bad weather.

We commend to the notice of our friends the letter of Mr. Bray, published in another column, which seems to open up a discussion that would be readily entered upon. The dimensions of a burner that may be successfully employed for the consumption of a given quantity of rich gas is one that can only be settled by the experience of the most expert manufacturers. We offer no opinion on the matter. The Referees burner is undoubtedly a good one; but probably a better may be devised, and Mr. Bray's opinion on the subject is worthy of all respect.

Water gas, which we cannot help thinking to have a promising future, especially as an auxiliary to coal gas, is, as will be seen by reports in another column, condemned in America. To speak frankly, we do not understand the reports of the chemists which we print. There must be errors somewhere, or we have been altogether misled as to the nature of the Lowe process. The proportions of the ingredient vapours and gases differ considerably from what we should expect; and the illuminating power, as detailed, is not what we should have anticipated under the several circumstances. We are not at all sorry that the experiment has failed; but, looking forward, as we do, to a day in which the manufacture of gas must be cheapened, we still entertain hopes that petroleum oils and the products of the decomposition of water may prove useful auxiliaries to Gas Companies.

### Water and Sanitary Notes.

It seems that the two great reforms necessary to make London a complete Municipality will be brought before the attention of Parliament in the ensuing session. A Bill, the origin of which cannot be doubtful, we understand has been printed, which is to confer the benefits of an unitarian Corporation for the whole of the metropolitan area. Besides this, the Earl of Camperdown is to introduce a measure, which, for the moment, we regard as even of greater preliminary importance—to provide for the popular election of the members of the Metropolitan Board of Works, on the principle of the School Board elections.

The short, and probably stormy, sitting of Parliament which will open on the 17th, will be entirely occupied with foreign affairs, with which we have, here, nothing to do. Of what will be promised, as regards domestic legislation, in the Royal Address, we have, of course, no knowledge; but we may safely predict that metropolitan concerns will be left entirely neglected by the present Government. When, after that short and stormy sitting, Parliament re-assembles, about the middle of March, sloppy talk about British interests in the East will probably form the staple of the utterances of Government officials. Of real and earnest domestic legislation we do not expect to hear one word. There are, indeed, one or two questions which concern the territorial aristocracy more than any one else, which may occupy the attention of Parliament for some time; but these are simply questions of the transfer of land burdens to the Consolidated Fund. The prospect is not pleasing; but, so



far as our limited vision permits us to see, this is all, as regards domestic legislation, that we can expect to witness.

Nothing nobler could engage the attention of an energetic and really statesmanlike Government than the elaboration of a scheme for the municipal organization of the whole Metropolis, which should at once and for ever abolish Guzzledom and Vestrydom. Failing this, we would accept with pleasure Lord Camperdown's proposal for the popular election of the members of the Metropolitan Board. But it will not be accepted. In the meantime we notice that the most influential portion of the Metropolitan Press are now advocating the opinions which we have expressed for several years. Metropolitan improvements progress too slowly. Wide stretches of desert lie along every line of new street made by the Metropolitan Board, and for reasons which every business man will fully comprehend. In Paris, the vacant spaces caused by Haussmann's immense demolitions were rapidly filled up, owing, we believe, to the immediate sale of the freeholds. In this Metropolis, unfortunately, a very different system is pursued, and thus we have not a few spots vacant, in which nothing is produced for rates in the parishes in which they lie, and for nothing else.

We have received from the Thirlmere Defence Association an appeal to support their views. We are sorry that we cannot help them. Our opinions on the matter in question have been very plainly stated. With as keen a love for natural beauty as can be possessed by a human being, we still hold that the comfort and well-being of a large population are of infinitely more importance than the little alteration of the shores of a lake, offensive to the taste of a few Cockney tourists and artists. We go further, and, with some knowledge of the district, state a confident opinion that the aspect of the lake and its surroundings will not be altered for the worse if the designs of the Manchester Corporation are carried out. The enthusiasts who are now opposing the Corporation with all their might will, in the course of ten years, become perfectly reconciled, and probably discover new beauties in the object of their worship transformed into a useful reservoir. They will reflect, perhaps, that the heaven-sent rain, which now runs uselessly to the sea, blesses the inhabitants of a crowded city and its hardly less crowded suburbs, and even if (which we do not believe will occur) something which the sentimentalists may consider a disfigurement should take place, the eye would soon become reconciled to it. A new race of tourists springs up every year, and Thirlmere and its surroundings, whatever may happen, will ever continue to be an object of interest. While fully sympathizing with the Thirlmere Defence Association and their views, we still hold that the wants of Manchester are of paramount importance, and for that reason we give our fullest support to the scheme of the Manchester Corporation.

It is not at all improbable that another of the Lakes may be appropriated to a useful purpose. The Welsh scheme of the Liverpool Corporation is certain to be opposed by every one interested in the Severn. They may get either Haweswater, Ullswater, or Windermere without any difficulty, and to one of these sources, we believe, they will eventually be driven for the additional supply they need.

Some very useful work has been done by Mr. G. W. Wigner, F.C.S., who has analyzed the water supply of most of our southern seaside health resorts. For the most part, the waters cannot be considered unsatisfactory, while some are reported excellent in quality. A few, however, have been strongly condemned. We hope when Mr. Wigner has completed his examinations, the scattered papers in the *Sanitary Record* will be collected in a volume, and made more generally accessible. Little as we believe in the transmission of disease by means of a water supply, it is always satisfactory to know when the supply is pure. A knowledge that the water was good at a certain place would decide many visitors in the choice of a holiday resort, and we might predict a large circulation for Mr. Wigner's book, if he should see fit to publish one.

The Vestry of Paddington, having an exceptional opportunity, have resolved on doing their own dusting, slopping, and watering, and so saving £3900 a year. The resolution, we think, is wise. The contract system, which, on commercial principles, we would advocate, works badly. It is, unfortunately, to the contractor's interest to neglect his work, and since competition in the business—the few Golden Dustmen having it all their own way—is out of the question, the contract prices are reported as exorbitant. Golden Dustmen, however, are rapidly disappearing. One by one the Metropolitan parishes are taking the work into their own hands, and, in the main, do it well. Energetic and intelligent superintendents are the only things necessary for complete success, and if Paddington secures these, the ratepayers may be congratulated on the change.

DESTRUCTIVE DISTILLATION.\*

Under a somewhat affected title, Dr. E. J. Mills has published a little manual which, in a small space, conveys a great deal of useful information. The exceptional opportunities enjoyed by the author, as the holder of a professorship endowed by Mr. Young, the eminent paraffin oil distiller, has enabled him to acquire a large amount of practical information, and we only regret that, instead of producing this "Manualette," he has not written a larger work, giving full details of the industries here so briefly described. Dr. Mills is a philosopher, and begins at the beginning. He tells us at starting that destructive distillation is carried on in a retort, followed by a condenser and receiver, and that the substances to be operated upon are placed in the retort, information useful if not particularly novel. The work treats, in successive chapters of the production from coals and shales of paraffin oils, the mode of purifying which is pretty fully described. Then of the distillation of coal and wood tars, with an account of the products. Then follows a description of the mode of distilling rosin, and the products obtained, and, subsequently, chapters on the distillation of lignite, bone oil, and the rectification of petroleum. All these contain useful information, which we regret has not been more extended. We make the following extracts from the chapter on the distillation of coal, mainly for the purpose of putting our readers in possession of the most recent chemical nomenclature and formulæ, and in some instances the corrected boiling points of the various substances obtained.

Coal tar is formed by the destructive distillation of coal at a high temperature, usually a bright red heat, or beyond. Although it contains fatty hydrides, they are chiefly liquid ones, and not paraffin. Among its constituents are aromatic hydrides (of which traces only are found in natural or artificial petroleum), their alcohols (occurring in very small quantities in petroleum), and naphthalene (absent from petroleum). Chrysene occurs both in the low and high temperature oils.

If the general formulæ of fatty be compared with those of aromatic compounds, as in the following examples—

	Fatty.	Aromatic.
Hydrides . . . . .	$C_nH_{2n+2}$	$C_nH_{2n-6}$
Alcohols . . . . .	$C_nH_{2n+2}O$	$C_nH_{2n-6}O$
Olefines . . . . .	$C_nH_{2n}$	$C_nH_{2n-8}$

we observe that aromatic bodies contain eight weights of hydrogen less than the corresponding fatty bodies. Thus is the high temperature industry, to the extent that it is specially characterized by aromatic compounds, a dehydrogenizing process.

Purified coal gas contains about 0.5 volume of hydrogen, rather more than 0.3 volume of marsh gas, 0.05 volume of olefines, and 0.05 volume of carbonic oxide.

The treatment which the crude tar undergoes is remarkably similar to that to which crude paraffin oil is submitted. The liquor is separated from it, and treated for ammonia exactly as in the low temperature industry, and yields about the same per centage return.

Coal yields from 1 to 2 per cent. of liquor, from 3 to 6 per cent. of tar, and about 50 to 70 per cent. of coke (containing 2½ per cent. of ash); the remainder represents the yield of gas and the working loss (about 10 per cent.). It is usual to distil coal, or such a mixture of coals, as shall yield about 9000 cubic feet of gas (sp. gr. 0.6) per ton, or about 20 per cent.

Modern tar is, as a rule, heavier than the liquor; this must necessarily be the case where naphthalene is produced in quantity. It is treated with steam (or distilled with one-fifth of its volume of water, or distilled by the heat of a steam coil) to remove light naphtha, or crude "benzol." The stills hold from 500 to 4000 gallons, and are horizontal cylinders. The steam brings over about 10 per cent. at most of light naphtha (sp. gr. 0.78 to 0.83), and some ammoniacal water, which is treated like the other "liquor." The residue of the distillation is heated by fire to about 200°, when most of the heavy oil comes over, and afterwards to over 300°. The residual pitch, which amounts to 30 to 50 per cent. of the tar, is, after several hours cooling (either in the still or a separate tank), run off into moulds; it is generally utilized for "asphalte," by mixture with about four times its weight of sand, chalk, or other inert material.

The light naphtha is run off the "liquor" beneath it, and churned with about 5 per cent. of oil of vitriol, and afterwards with about 2 per cent. of caustic soda (in aqueous solution, of sp. gr. 1.4). Lime may be advantageously used instead of soda, if great care be taken to avoid excess. Sometimes the naphtha is distilled between the acid and alkaline treatment; on the other hand, the lime and acid treatment may be performed, if desired, in the same tank. Mixtures of lime and caustic soda are also used; and this is probably the preferable course. It is also undoubtedly advisable to re-distil the crude benzol before submitting it to this chemical treatment. The residues of this second distillation, when mixed with lime, yield a lubricating "grease," as is the case with several genera of unsaturated hydrocarbons. Finally, the purified benzol is distilled by steam. It then has a specific gravity of about 0.86.

The heavy or "dead" oil may be used, as such, for preserving or "kreasoting" timber. It is more commonly distilled. The earlier portions of the distillate (150° to 200°) contain phenol and its homologues ("kreasote"); the following portions (200° to 212°) are rich in naphthalene; and the next fraction (to 360°) yields crystals of anthracene on cooling. Naphthalene is not at present utilized on the large scale; but anthracene is the source of artificial alizarine. Tar yields rather less than 1 per cent. of anthracene. The mother liquid of the anthracene, after further concentration by distillation, and a second deposition of crystals, is chiefly valuable for illuminating and, more especially, for lubricating purposes. The treatment of the phenol fraction is the object of a special industry, that of carbolic acid. There can be little doubt that the future economical treatment of dead oil, and, in general, crude oils of high boiling point, will, in the main, turn upon some method of distillation *in vacuo*.

Annexed is a table of the known products of the destructive distillation of coal. The formulæ, boiling points, and melting points are added, so far as known.

\* "Destructive Distillation: A Manualette of the Paraffin, Coal Tar, Rosin Oil, Petroleum, and Kindred Industries." By E. J. Mills, D.Sc. (London), F.R.S., "Young" Professor of Technical Chemistry in Anderson's College, Glasgow. London: Van Nostrand, 1877.

† Formerly this distillate was allowed to reach the surface of the water.



Destructive Distillation of Coal.

Name.	Formula.	Boiling Points.	Melting Points.
Hydrogen . . . . .	H <sub>2</sub>	—	—
Methylic hydride . . . . .	CH <sub>4</sub>	—	—
Hexylic . . . . .	C <sub>6</sub> H <sub>14</sub>	68°	—
Octylic . . . . .	C <sub>8</sub> H <sub>18</sub>	119	—
Decylic . . . . .	C <sub>10</sub> H <sub>22</sub>	—	—
Paraffin . . . . .	C <sub>n</sub> H <sub>2n+2</sub>	—	—
Ethylene . . . . .	C <sub>2</sub> H <sub>4</sub>	—	—
Tritylene . . . . .	C <sub>3</sub> H <sub>6</sub>	—	—
Pentylene . . . . .	C <sub>5</sub> H <sub>10</sub>	31	—
Hexylene . . . . .	C <sub>6</sub> H <sub>12</sub>	71	—
Heptylene . . . . .	C <sub>7</sub> H <sub>14</sub>	97	—
Acetylene . . . . .	C <sub>2</sub> H <sub>2</sub>	—	—
Crotonylene . . . . .	C <sub>4</sub> H <sub>6</sub>	18	—
Hexoylene . . . . .	C <sub>6</sub> H <sub>10</sub>	80	—
Benzol . . . . .	C <sub>6</sub> H <sub>6</sub>	80	3°
Parabenzol . . . . .	C <sub>8</sub> H <sub>6</sub>	97	—
Toluol . . . . .	C <sub>7</sub> H <sub>8</sub>	111	—
Xylois (3) . . . . .	C <sub>8</sub> H <sub>10</sub>	139	—
Cumol (?) . . . . .	C <sub>8</sub> H <sub>12</sub>	166	—
Mesitylene . . . . .	C <sub>9</sub> H <sub>12</sub>	163	—
Cymol . . . . .	C <sub>10</sub> H <sub>14</sub>	177	—
Naphthaline . . . . .	C <sub>10</sub> H <sub>8</sub>	218	79
Anthracene . . . . .	C <sub>14</sub> H <sub>10</sub>	360	213
Methanthracene . . . . .	C <sub>13</sub> H <sub>12</sub>	—	196
Chrysene . . . . .	C <sub>18</sub> H <sub>12</sub>	—	249
Retene . . . . .	C <sub>19</sub> H <sub>16</sub>	—	—
Pyrene . . . . .	C <sub>16</sub> H <sub>10</sub>	—	142
Water . . . . .	H <sub>2</sub> O	100	0
Hydric sulphide . . . . .	H <sub>2</sub> S	—	-85
Hydric sulphocyanide . . . . .	HCNS	—	—
Carbonic oxide . . . . .	CO	—	—
Carbonic dioxide . . . . .	CO <sub>2</sub>	-78	—
Carbonic disulphide . . . . .	CS <sub>2</sub>	47	—
Sulphuric dioxide . . . . .	SO <sub>2</sub>	-10	—
Hydric acetate . . . . .	C <sub>2</sub> H <sub>4</sub> O <sub>2</sub>	120	15
Phenol . . . . .	C <sub>6</sub> H <sub>6</sub> O	188	35
Cresol . . . . .	C <sub>7</sub> H <sub>8</sub> O	230	—
Phlorol . . . . .	C <sub>9</sub> H <sub>10</sub> O	219	—
Rosolic acid . . . . .	C <sub>20</sub> H <sub>16</sub> O <sub>4</sub>	—	—
Brunolic acid . . . . .	C <sub>27</sub> H <sub>20</sub> O <sub>2</sub>	—	—
Ammonia . . . . .	NH <sub>3</sub>	-33	—
Butylamine . . . . .	C <sub>4</sub> H <sub>11</sub> N	75·5	—
Aniline . . . . .	C <sub>6</sub> H <sub>5</sub> N	182	—
Cespitine . . . . .	C <sub>8</sub> H <sub>13</sub> N	96	—
Pyridine . . . . .	C <sub>5</sub> H <sub>5</sub> N	115	—
Picoline . . . . .	C <sub>6</sub> H <sub>7</sub> N	134	—
Lutidine . . . . .	C <sub>7</sub> H <sub>9</sub> N	154	—
Collidine . . . . .	C <sub>8</sub> H <sub>11</sub> N	170	—
Parvoline . . . . .	C <sub>9</sub> H <sub>13</sub> N	188	—
Coridine . . . . .	C <sub>10</sub> H <sub>15</sub> N	211	—
Rubidine . . . . .	C <sub>11</sub> H <sub>17</sub> N	230	—
Viridine . . . . .	C <sub>12</sub> H <sub>19</sub> N	251	—
Leuocoline . . . . .	C <sub>9</sub> H <sub>9</sub> N	235	—
Lepidine . . . . .	C <sub>10</sub> H <sub>9</sub> N	260	—
Cryptidine . . . . .	C <sub>11</sub> H <sub>11</sub> N	—	—
Pyrrhol . . . . .	C <sub>8</sub> H <sub>7</sub> N	133	—
Hydric cyanide . . . . .	HCN	26	—
Fluorene . . . . .	C <sub>13</sub> H <sub>10</sub>	302	—
Phenyl . . . . .	C <sub>12</sub> H <sub>10</sub>	239	70
Acenaphthene . . . . .	C <sub>12</sub> H <sub>10</sub>	269	100
Phenanthracene . . . . .	C <sub>14</sub> H <sub>10</sub>	340	99
Carbon (hydrogenated) . . . . .	C <sub>n</sub>	—	—

The total amount of coal mined in 1874 was about 260 million tons. Of this, the United Kingdom produced about 125 million tons, 8 per cent. of which may be taken as used for gas-making; this would correspond to about 450,000 tons of oily tar.

We may conclude by strongly recommending this "Manualette" to all our readers who may desire to obtain information on the subjects of which it treats.

A TREATISE ON THE SCIENCE  
AND PRACTICE OF THE MANUFACTURE AND  
DISTRIBUTION OF COAL GAS.  
CLIII.

DISTRICT GOVERNORS.

The pressure of gas in the mains varies according to the elevation, increasing at the rate of nearly one-tenth of an inch for each 10 feet of rise, or about an inch for every 100 feet, and decreasing in the same proportion for a similar amount of fall.

The explanation of the phenomenon is found in the laws which affect the relative pressure of æriform fluids of varying densities at different altitudes. As the elevation increases, the atmospheric pressure diminishes, and *vice versâ*. So that if the pressure as given by the weight of the gasholder, or of the governor, as the case may be, is equivalent to a column of water of 2 inches at the works, at a height of, say, 100 feet the gas is relieved of that amount of atmospheric pressure, which, after allowing for the gravity of the gas, is equal to a column of water nearly 1 inch in height; hence the pressure at this point will be about 3 inches.

The amount of increase and decrease, of course, depends on the specific gravity of the gas. The greater that is, the less the variation, and *vice versâ*; and, supposing a holder inflated with atmospheric air instead of gas, no variation of pressure would be found to exist at different levels.

Philosophically stated, the reverse of the received axiom is the truth, because the higher the elevation of the main, the less the actual pressure of the gas; just as the higher we ascend into the atmosphere the less we find the atmospheric pressure to be. The

difference in pressure, as indicated by the gauge, is due to the different ratios of the specific gravity of the gas and the air, thus:—

	Inches.
A column of air 100 feet high is equal in weight to a column of water of a height of . . . . .	1·473
A column of gas 100 feet high, specific gravity ·320 (air being 1·000), is equal in weight to a column of water of a height of . . . . .	·473

Difference, pressure indicated by the gauge 1·000

Gas-works are usually erected at or about the lowest part of the district of supply, with the object of taking advantage of this natural law of the increase of pressure as the main rises, so that the diminished pressure caused by the draught on the main during the hours of consumption may be compensated for by the natural increase. As many districts are extremely irregular in their surface level, the highest parts in some instances being considerably above the lowest, it follows that the like irregularity characterizes the pressure in the main, which, if the lower portions of the district are adequately supplied, must be excessive in those more elevated.

We will suppose that the initial day pressure given at the gas-works, and in the lowest parts, is 7-10ths of an inch; if the levels of the district vary to the extent of 100 or 200 feet, the pressure at the former will be 17-10ths, and at the latter 27-10ths. Again, during the lighting hours, when the initial pressure is increased to, say, 15-10ths, the pressure at those elevations, provided the mains are adequate in size, and allowing for the draught upon them, will range from about 22 to 32-10ths respectively. These high pressures are excessive and wasteful, causing heavy leakage wherever faults exist in the mains and services, such leakage being in the proportion of the square root of the pressure.

To reduce these excessive pressures in the more elevated parts, district governors are necessary, and their adoption invariably results in a saving that, in a brief space of time, more than compensates for the expenditure incurred by their application.

The ordinary governor would answer the purpose of reducing the pressure, and it has been so applied, being adjusted so as to give the maximum night pressure on its outlet. This is a very partial remedy for the evil. To obtain the full advantage from them, they would have to be adjusted every morning to the pressure needed in the daytime, but in order to give the additional amount required during the hours of consumption, a re-adjustment would require to be made every evening at dusk, which would entail the attendance of a person at each governor, for that purpose. This is a fatal objection to their employment, even if their dimensions were suitable. A special kind of apparatus has, therefore, been devised, which, whilst occupying but little space, effects automatically, or by means of the pressure given at the works, the desired changes during the 24 hours.

Separate and distinct mains are laid from some works to the districts at the different altitudes, and as the pressure on each of them is controlled by its own governor, the difficulty is in this way partially overcome. This is a good arrangement wherever it can be carried out at a reasonable expense, but it is not always practicable to do so; and even when it can be done, it may with advantage be supplemented by the use of the district governor.

The first, or one of the first applications of a district governor fulfilling the conditions indicated, was made by the late Mr. Joseph Adamson, when engineer of the Leeds New Gas Company. The governor invented by him, and which is represented in section and elevation in figs. 1 and 2, somewhat resembles the throttle-valve of a steam-engine, contained within a straight pipe connected to the line of mains. The valve, A, is formed of two discs of tin, with a disc of oiled leather, similar to that employed in dry gas-meters, rivetted between them, and so arranged as to allow of the full orifice

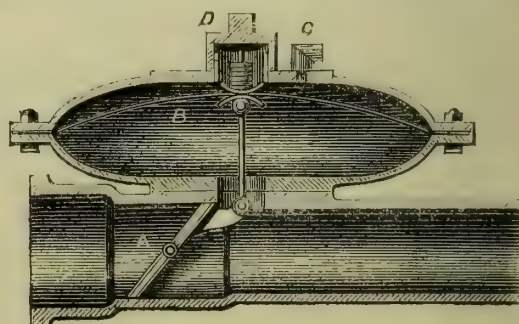


FIG. 1.

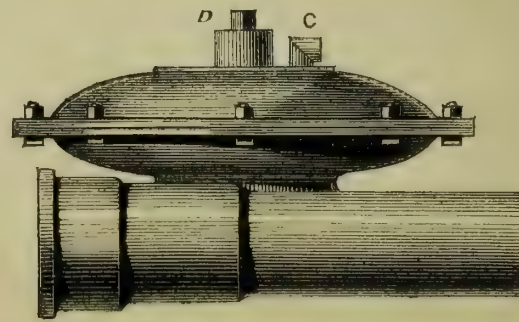


FIG. 2.



of the pipe being opened if required. The actuating diaphragm, B, is also of leather, secured between the flanges of the cast-iron chamber over the main. The space in the chamber above the diaphragm is open to the atmosphere by means of an air-pipe connected to the elbow, C, carried to a height of 10 or 12 feet up the side of any adjacent building. A removable cap, D, admits of the adjustment of the valve, by means of small weights to give any desired pressure.

The governor, which is simple in construction and effective in its action, works with but little friction, and any liquid produced by condensation in the main passes through to the ordinary syphon-well, so that there is no danger of obstruction from this cause.

The late Mr. Orlando Brothers invented a district governor, which is represented in the annexed engraving, fig. 3. It consists of an outer

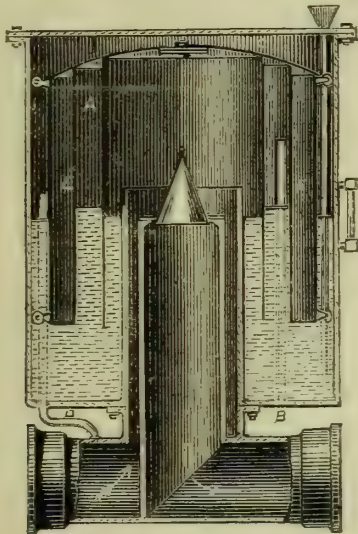


FIG. 3.

cylindrical case, with inlet and outlet pipes arranged as in the ordinary station-governor. The holder or bell is formed with a difference chamber, marked A on the drawing, and this is open to the atmosphere by means of the pipe, B. The outer case is closed at its upper end by a plate or cover, and between this and the top of the holder, C, the inlet gas is admitted by the pipe, D. The inlet-gas pressure acts also on the under side of the holder crown; but as the area of the space on which the pressure exerts its force underneath is circumscribed by the space occupied by the difference chamber and the air-chamber or float, the downward pressure acting upon the whole surface of the crown gently overcomes the upward pressure, forcing the float downwards, and so opening the valve. E is the air-chamber or float, and as this extends from top to bottom of the holder, the deeper the latter is immersed in the water the greater the buoyant power exerted to close the valve. The several chambers described are proportioned in area to each other according to the size of the apparatus.

In adjusting the governor, water is run in until the pressure is reduced on the outlet side to what is required in the daytime, and, by thus regulating the water-line, any desired outlet pressure, being less than that of the inlet, can be given, dependent, of course, on the changes made in the pressure at the gas-works.

(To be continued.)

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### PATTERSON VERSUS THE GASLIGHT AND COKE COMPANY.

#### A FINAL APPEAL.

SIR,—With reference to your remarks on the failure of my appeal to the House of Lords, permit me to make the following observations. To the tone and spirit of your remarks I have nothing to object—I gratefully acknowledge their fairness and good feeling; but in some of your statements you have inadvertently erred, and there are one or two others which I desire to refer to on my account, and indeed also of patentees generally.

(1.) You are mistaken in saying that my experiments in connection with the half-dozen various processes, included in my patent, were made at the expense of the Gas Companies or the public. The whole of the expenses for apparatus, materials, and assistance were paid for by myself; and the receipts for these disbursements are still in my possession.

(2.) On the very first clear day (the 11th of March) after my patent was filed, I called upon and showed my patent to the three Gas Companies with whom the Referees had to do, stating that they might have the use of each and all of my processes "at a merely nominal royalty." No objection of any kind was made to my patent—indeed, the only question was: "Will it do?" And the Secretary of the Chartered Company said to me: "I do not see why you should be so generous; if your process is worth using, it is worth paying for." Contrast this with the conduct of patentees generally.

(3.) None of the experimental processes tried in gas-works, whether at the suggestion or even within the knowledge of the Gas Referees, had any bearing upon or connection with my inventions. These experiments (as stated in evidence and unquestioned) were—firstly, two processes of Mr. Vernon Harcourt's, which the Referees were required to obtain a

trial of, by the President of the Board of Trade, then Lord Carlingford. Secondly, there was Mr. Evans's superheated-steam process—experiments which, it is hardly necessary to say, were instituted by Mr. Evans himself, but which the Referees had opportunities of seeing at work. Lastly, there was Dr. Letheby's latest and pet proposal to admit ammonia into the lime purifiers; and this was the only experiment in gas-works suggested spontaneously by the Referees, and, of course, it was an entirely costless operation. Each and all of the processes thus tried proved entire failures, and, obviously, not one of them had any bearing upon any part of my patented inventions.

In fact, the only experience and information obtained by the Referees from the Gas Companies and their officers, upon this long-existing sulphur difficulty, was the experience and information of failure—as, indeed, was constantly stated by the Companies and their officers themselves down to the time when I showed my specification to the Companies on March 11, 1872, Mr. Harris, among others, stating that he had "no control" over the sulphur, nor any knowledge as to the cause of the extraordinary fluctuations, and that the Companies would not be safe under even a 50 or 60 grain maximum.

(4.) You make, perfectly naturally, a mistake in repeating the allegation so strangely made in Lord Justice James's judgment—that the Beckton report was delayed in its issue, in order that, in the meanwhile, I might patent my new processes, one of which, out of the half-dozen, being described, with my permission, in that report. That Lord Justice James should have made such a statement only shows how imperfectly he and his colleagues had read the evidence. As I showed to the House of Lords (with the signified acquiescence of the Lord Chancellor), such a statement was wholly unfounded, the defendants themselves expressly stating in their "Answer" that the report had been kept back "at the request of some of the Company's officers;" and the same fact is shown in half-a-dozen parts of the evidence which I read before the House of Lords. The Referees, as soon as they had the Beckton report in type before them, on the 31st of January, considered the report incomplete, and applied for certain reports from the Chartered Company, which were promised by the Secretary of the Company, who at the same time urgently requested by letter that the Referees should "withhold their report" on the Beckton works until the Company could make their further communications. In fact, my patent was filed on the 9th of March, and the Beckton report was not issued until the 26th. And the House of Lords, with this superabundant evidence before them, dropped this most baseless charge made by Lord Justice James—a charge, I repeat, which the defendants themselves repudiated, and, by their "Answer," contradicted.

(5.) Your objection to my second claim, or rather to the first part of it, for the second part is unnoticed either by you, or by the Lords Justices, or by the House of Lords, is (although I object to it) perfectly intelligible, and fairly arguable. Your objection is this—that although the said process is a valuable improvement (I should think it is), nevertheless, as old materials and apparatus are employed, the process is not sufficiently novel and distinctive to be the proper subject of a patent. And this was the judgment of the Lords Justices in the intermediate Court of Appeal. They also said that the first time that any mention of the said process is to be found in all the voluminous evidence is on Jan. 31, 1872, when our "Beckton Report" was for the first time in type or proof; but they held that subsequently thereto (neither time nor circumstance being mentioned by their lordships, or anywhere alleged in the evidence), I had communicated the said process to the Chartered Company, and that some "prior user," although admittedly unsuccessful, had taken place a few days before I filed my patent.

This was the judgment of the Lords Justices, upon which point they were directly at variance with Vice-Chancellor Bacon, before whom the whole case had been minutely investigated for no less than 17 days, and who, having seen and heard the witnesses in Court, acted as jury as well as judge. It is important to note that the House of Lords did not adopt the view taken by the Lords Justices. The House of Lords did not hold that my second claim, or any part of it, was not the proper subject of a patent. And this is a very important matter as regards other patentees. The House of Lords saw (from the evidence on both sides) that, besides the employment of the old materials, there were entirely new testings, and also new machinery or appliances for testing the old materials and apparatus—these testings, both for CO<sub>2</sub> and CS<sub>2</sub>, when thus employed (and as they are employed both at Bow and Beckton, and now in London gas-works generally), being not only novel in themselves, but also requiring special apparatus, it being impossible to employ these tests in such a manner without having special apparatus for preparing the gas for the making of these tests—viz., by previously extracting the SH<sub>2</sub> with which the gas is fully charged at the points where these new testings are applied.

In fact, my second lime process is far more distinctive in its character, and more readily recognizable than the vulcanite patent or a hundred others, the validity of which patents has been approved by the Law Courts. Neither did any of the defendants witnesses allege that the said process was not readily recognizable. And, as you are well aware, both before the Committee of the House of Commons on the Sulphur Question last session, and in the recent Bromley nuisance case tried before Mr. Justice Fry, "Patterson's Process" was referred to again and again, both by chemists and gas engineers, as a process which needed only to be so called to be at once understood in the gas world.

(6.) The grand objection taken, and unanimously held, by the House of Lords, and which proved fatal to my patent, is one which was quite new in the case; that is to say, it is one which was not adopted by the Court of Appeal, and which (although pleaded by the defendants counsel when their original objections had failed or were in jeopardy) was not contained in any shape in either the "Answer" or the "Further Answer." Evidently, to my mind at least, the House of Lords had overlooked this fact; for, according to all legal principles and practice, it is not allowable to raise or to give effect to any objection which has not been clearly set forth in the "Answers" or original pleadings, and for which, of course, the plaintiff could not be prepared either with evidence or with argument. And I was not heard upon this point, the Lord Chancellor stopping me when I began to deal with the respondents "Printed Case," on the ground that it was "unusual and inconvenient



to do so at this stage of the procedure," and I was allowed no other opportunity.

This grand objection to my first and second claims, held unanimously by the House of Lords, and which, as a necessary consequence, has proved fatal (temporarily, at least) to my whole patent, as you correctly state, was this: They held that the Gas Referees are bound to assist the Gas Companies in improving the processes of gas manufacture; and that any Gas Referee who discovers an invention in gas manufacture, or who in any way (whether confidentially or not) becomes aware of any method of improvement, is bound to give information to the Gas Companies of that new process or improvement, as soon as he himself becomes aware of it. Accordingly, as admittedly I had communicated my lime process to my colleagues (although the communication was made by me, and accepted as confidential), this was to be regarded as equivalent to a "publication" of my process. This much was held unanimously by the House of Lords. But the Lord Chancellor went further. According to his lordship's judgment, the effect would have been the same, even had I not communicated my invention to my colleagues; his lordship holding that, even had I kept my invention to myself, nevertheless this purely private knowledge on my part must be held (of course, by a legal fiction) to be public knowledge, inasmuch as, according to his lordship, every Gas Referee is bound in duty to convey his knowledge at once to the Gas Companies, and therefore must be held to have done so. As it seems to me, the Lord Chancellor adopted this extreme view because he felt the weakness of the legal fiction of maintaining that a communication of an invention made confidentially, and which certainly was not communicated either to the Gas Companies or to the public, was a publication, or rather could be held to be, a publication or a piece of public knowledge.

This, I say, is the Lord Chancellor's judgment on the matter. Lord Blackburn, however, differs upon this point, holding that publication of the lime process would not have been made had I not communicated my discovery to my colleagues prior to filing my patent. Lord Blackburn says: "If the date of the report had been after the date of the patent, the case upon this would, it seems to me, have been quite unarguable. The date of the patent was, however, before the contents of the report were known to the Gas Companies, though several weeks after they were known to the whole of the Gas Referees and their Secretary; and, as I have already pointed out, the moment the Referees became aware of what was stated in the report, it became the property of the public. . . . The Referees were bound to make it known, and even if they kept it back, the invention was no less the property of the public from the time the Referees knew of it."

(7.) Then as to the evidence on other points. The Court of Chancery held my patent valid in every respect, both of fact and of law, the technical framing of the patent included. The Court of Appeal (besides holding that the last three claims were useless, although one of these processes is in successful operation at the South Metropolitan works) held that I was the discoverer of the lime process, but that I communicated it to the Chartered Company, and that some "prior user" of it had taken place before my patent was filed. Further, the Court of Appeal held that my second claim was not patentable. The House of Lords unanimously dropped the objection to the last three claims, and also to the patentableness of my second claim, and also dropped the "prior user" (as distinct from the question of non-novelty) of the lime process, and the Lord Chancellor and Lord Gordon also dropped the objection to the non-novelty of the lime process, except by the above-mentioned "publication" thereof by a fiction of law.

In my statement of my case (which I regret you do not report) I read to their lordships plain admissions of the novelty of my lime process, and direct statements against any "prior user" of it having taken place either at Bow or Becton, made in Court by the Company's own witnesses. For example, Dr. Odling, who had "fully inspected" the Becton works a few days before, and again a few days after the date of my patent, is asked, relative to the new lime process, Q. 920: "It had not then (March 28) been tried on a manufacturing scale?—No." "You did not know whether it would succeed?—No." Then, after he describes what used to be done at Bow, he is asked, Q. 995: "That was essentially different from what was recommended by your lecture (viz., the new lime process) in 1872?—Yes." "No process similar to that recommended in your lecture in June, 1872, was carried on at Bow, to your knowledge, up to the date of that lecture?—No." Finally, Dr. Odling states, Q. 1050: "I thought the report of the Referees and my own report were jointly new. It seemed to me then, in ignorance of Mr. Mann's patent, that we were the first to definitely point out the principles applicable to gas manufacture; but I find that, with regard to pointing out the principle, we have been forestalled by Mr. Mann. At that time I should have claimed rather more than a mode of doing it; I should have claimed, as Mr. Patterson does, the enunciation of the principle of doing it."

Can there be better testimony to the entire novelty of my lime process than this? And next to this direct testimony of Dr. Odling, this abortive and dropped patent of Mann's (wherein he stumbles at the first step, taking no note of the  $\text{CO}_2$  as preventing the formation of  $\text{CaS}$  in lime purifiers) proves conclusively how entirely novel my invention was. It is true that Lord Blackburn expressed the opinion that the present process at Bow—viz., the present "measuring of the gas," together with testings for  $\text{CO}_2$  and  $\text{SH}_2$  on the first lime purifier, and for  $\text{CS}_2$  on both the first and second lime purifiers, as well as upon the manufactured gas—had all been adopted in 1867!—although Mr. Harris stated that he "could not remember" when these testings were first employed; and although the foreman at Bow stated in Court that the present method had been adopted only "three, four, or five years ago"—three years ago being, at Christmas, 1872, more than ten months after the date of my patent. Indeed, the opinion of Lord Blackburn upon this matter (and also, I may say, the confounding of my first and second processes, which are distinct, and the former of which has not been in use even to this day) shows, I submit, how seriously patentees may suffer at the hands of the law, when judges are not adequately conversant with the manufacturing operations to which the patent relates. As the result of my five years experience in patent legislation, I advise every patentee to trust his case to a jury, rather than to the hair-splitting technicalities of pure "law."

I am much disappointed that you have been unable to give a report of my statement before the Lords, wherein I set forth the evidence of the defendants own witnesses in my favour, and which makes plain why it was that the House of Lords (at least as regards the majority of their judgments) dropped almost all, if not every one, of the objections sustained by the Court of Appeal—notably (1), the objection to my three last claims; (2) the alleged "prior user" of my second claim; and (3) the objection that my second claim was not a patentable invention—the judgment of the House being given against me upon a purely legal point—a point, too, which had not been held in the Court of Appeal, and which was not even set forth in the defendants "Answers!"

The effect of this decision will be of the widest importance to patentees. I know that not a few leading men in the gas world are not "glad" at this decision, believing, as they do, that this most valuable invention has been most unjustly dealt with; and the clever class of gas managers (the men who can make inventions) will have reason to regret it on their own account. Since a Gas Referee who, according to the terms of his appointment, and as hitherto believed, has nothing to do with conducting the business of gas companies, is held disqualified from holding a patent, this will *à fortiori* hold good with gas managers and *employés* in every branch of manufacture—these men being paid for the express purpose of conducting the business to the best of their ability.

In conclusion, and as a matter relating to myself, let me say a word as to your concluding sentence. You say: "The special misfortune to Mr. Patterson is that one part of a patent being held to be untenable, the whole is vitiated; and thus he loses his right to the methods of purification in closed vessels, of the success of which we had, and still entertain, great expectations. It may now be too late for a disclaimer."

Now, apart from the question of disclaiming, there is my second patent of January, 1873, when I was not a Gas Referee, and which includes, *inter alia*, the entire purification of coal gas by ammonia, obtained as an impurity from the gas itself. But take the case as you put it. What does it mean, but this? that the London Gas Companies, so great and wealthy, are now to sing in chorus, "Hurrah! We have now got not only Patterson's two first processes, one of which we have been using for the last four or five years, but we can now get his other and still better processes for doing the whole work of purification in closed vessels, and so without nuisance, and also cheaper than by lime and purifiers. We can now bag his whole patent; so let us rejoice over the plunder! Patterson did for us what we and all our officers and consulting chemists had tried in vain to achieve for 20 years. We are already free from fear of penalties, while our gas (*vide* Harcourt, Tidy, and others before the House of Commons Committee) is worth twopence extra per 1000 feet from its increased purity; and this by a process which of itself adds 10 or 12 per cent. to the illuminating power, making an equal saving in our coal accounts, and an almost entire saving of candle. And now, in addition, we can get Patterson's other and still better and still cheaper processes into the bargain!" I need not make any comment upon this. It speaks for itself; and the whole story of Patterson's patent, and the solving of the Sulphur Question, will remain memorable (I shall not use a less agreeable word) in the history of gas manufacture and its inventions.

22, Wingate Road, Hammersmith, Dec. 22, 1877.

R. H. PATTERSON.

#### NAPHTHALINE.

SIR,—A short analysis of M. Brémond's paper, descriptive of his process for the prevention of the deposit of naphthaline by the desiccation of the gas, and a comparison of the same with Mr. Aitken's process of desiccating gases, will show wherein the two differ.

M. Brémond, after referring to the great trouble entailed by the deposition of solid naphthaline in mains and branch-pipes, says that, up to the date of his researches on the subject, the only remedies proposed for counteracting the effects of naphthaline were all based either upon its solubility in tar—for example, by the prolongation of the contact of the gas with the tar—or upon its solubility in the oils of naphtha, petroleum, &c. He then asked the question, Are these remedies, when properly applied, sufficient to remove the naphthaline? And his answer is substantially to the effect that they are sufficient to remove the naphthaline produced in the retort during the process of destructive distillation; that, after the condensing and purifying apparatus have been passed, naphthaline does not remain in the gas—at least, in such quantities as to cause precipitation in the mains. But he says, further, although the naphthaline at this stage of the manufacture is removed, the precipitation of naphthaline in the mains, &c., is not prevented, for naphthaline is subsequently produced by synthetical reactions between some of the other hydrocarbons ordinarily contained in the gas, those reactions being due to the heat given out by the condensation of the aqueous vapours; or, at any rate, whatever may be their cause, those reactions do take place, because naphthaline is not deposited when the gas is entirely deprived of its water vapour.

The principal reason which M. Brémond assigns for the advancing of this new theory of the formation of naphthaline synthetically from some of the constituents of the gas, by the agency of the latent heat of the condensed water vapour, and for abandoning the idea of its pre-existence in the gas after its purification of the crystalline naphthaline which is deposited in the mains, &c., is, that if the crystallization is preceded by the condensation of the aqueous vapours contained in the gas, it obeys a law which might be thus expressed: In a mixture of several vapours, when one of these vapours attains its point of condensation, it displaces the point of condensation of the vapour with which it is mixed. He says that, up till now, this law has been neither laid down nor verified, that he has submitted it to the judgment of experienced physicists, and that he is authorized to say it is at the present moment the subject of study by the learned professor of physics, the superintendent of the College of France.

In your editorial of Oct. 16, you indicated your doubts as to the truth of this theory of the synthetical formation of naphthaline from the constituents of the gas, and, to my mind, the experiments you advised M. Brémond to make would have very clearly proved the justness of your conclusions, and convinced M. Brémond that his theory was without foundation. I shall, therefore, not further refer to this part of his theory, but confine myself to proving that the law relating



to the tension of mixed vapours, which he asserts has neither been laid down nor verified, is both well known and widely applied.

There is no standard work on physics which does not give Regnault's experiments on the tension of the vapours of mixed liquids. These experiments prove that—1, when two liquids exert no solvent action on each other, such as water and bisulphate of carbon, or water and benzole, the tension of the vapour which rises from them is nearly equal to the sum of the tensions of the two separate liquids at the same temperature—i.e., that the vapours from such liquids act towards each other as permanent gases. 2. With water and ether, which partially dissolve each other, the tension of the mixture is much less than the sum of the tensions of the separate liquids, being scarcely equal to that of ether alone—i.e., the limited solvent action of the vapours for each other prevents or counteracts their power upon each other as permanent gas. 3. When two liquids dissolve each other in all proportions, as ether and bisulphate of carbon, or water and alcohol, the tension of the vapours of the mixed liquids is intermediate between the tension of the separate liquids—i.e., the vapours act towards each other as if they were the vapours of the same compound. The above is just the inverse of the law given by M. Brémond, which might be thus stated: 1. In a mixture of several vapours derived from substances having no solvent action on each other, the vapours act towards each other as permanent gases. When the temperature of the mixed vapours is reduced, the vapour having the lowest tension is precipitated from the other as from a permanent gas; a portion of the vapour having the lowest tension being held in diffusion by the vapours having the highest tension, till it reach the point of condensation, when the whole is condensed together. 2. In a mixture of several vapours derived from substances which dissolve each other in all proportions, when the temperature is reduced, a portion of the whole of the vapours is simultaneously condensed, the quantity of each being dependent on the difference in tension between the vapours and the relative proportions in which they are present. 3. A mixture of several vapours derived from substances which only partially dissolve each other, on being reduced in temperature follows in part the laws previously given, dependent on the proportion of each vapour present.

The above laws are verified in an endless series of processes. For instance, in the distillation of coal tar and paraffin oil, steam is injected into the distilled fluid, and, the hydrocarbon vapour not being soluble in the water vapour or steam, acts in a manner similar to an atmosphere of permanent gas; the tension of the hydrocarbon vapours being added to that of the steam, the mixed vapours pass from the still to the condenser at a temperature somewhat under the separate volatilizing point of the distilling fluid. The hydrocarbon vapour being held in diffusion by the steam, on the temperature and consequent tension of the mixed vapours being reduced, the hydrocarbon vapours are precipitated or condensed from the steam as from a permanent gas, not a trace of water vapour being condensed till the temperature falls so far as to lower the tension of the steam below that of the atmosphere, when the whole steam and remaining vapours are condensed together.

Again, as an instance of the action of the vapours of substances which are soluble in each other, take the distillation and preparation of absolute alcohol from fermented liquors. The boiling-point or tension of the vapour from the mixed alcohol and water is intermediate between the two tensions of the separate vapours, and, as a matter of course, varies with the proportions in which the liquids they are derived from are present in the still; but however small the quantity of alcohol, and however large the quantity of water, or *vice versa*, alcohol and water will simultaneously distil together. On the tension of the mixed vapour being reduced in the condenser, the water vapour, in accordance with its lower tension, is first precipitated, but it invariably carries with it a small quantity of alcohol, dependent upon the relative quantity of vapour of alcohol and water present. Hence the reason why two separate fluids, which are soluble in each other, require such a number of fractionatings before they can be obtained pure, and why, in some cases, substances having a stronger affinity for one of the soluble substances have to be employed to remove the last traces—as in distilling alcohol over quicklime, which has a strong affinity for water, to remove the last traces of that substance. Those two processes illustrate the difference in the action of vapour *per se* derived from substances which do, and from those which do not, dissolve each other, and are sufficient to show that vapours, when mixed, affect the tension of each other. But perhaps the best illustration of the application of the laws relating to the tension of mixed vapours, when a very complex mixture of gases and vapours are to be arranged in groups, and separated by means of condensation, or the lowering of the vapour tension, is given in the condensation of coal gas.

The crude gases and vapours, as they enter the hydraulic main, may be divided into two groups—those substances which the manufacturer desires to retain as permanent gas, and those which he wishes to eliminate. To the former group belong the hydrocarbon gases and vapours of the volatile hydrocarbons; to the latter, the denser hydrocarbons and sulphuretted hydrocarbon compounds, which are solvents for the former in nearly all proportions; also water vapour, ammonia, carbonic acid, sulphuretted hydrogen, &c. The gas manufacturer has learned that to very suddenly cool his crude gases and vapours he reduces the illuminating power of the gas, the reason being that when the whole of the vapour tensions are reduced simultaneously and quickly, the solvent action of the denser hydrocarbons is allowed full play, and they therefore reduce the vapour tension of the volatile hydrocarbons absorbed, and remove them as tar. To prevent this action, the gases and vapours are cooled very slowly, in order that the vapour tension of the solvent denser hydrocarbons may be reduced first, thereby causing them to be precipitated at a temperature which will lower their solvent action as much as possible, and allow the gases to retain the vapours of the volatile fluids in diffusion.

But, however slowly the cooling may be effected, it will only modify the solvent action of the denser hydrocarbons to a limited extent. The slow cooling resembles a single distillation of alcohol and water. To entirely separate alcohol and water, it is necessary to subject them to a series of fractional distillations and condensations; and, for a similar reason, to separate the volatile hydrocarbons from the denser, it is necessary that they be similarly distilled and condensed. Mr. Aitken's

process for the condensation of crude gas is, as you are aware, based upon this mode of treatment. Careful fractional condensation will only separate the vapours of low tension; the vapours and gases having a high tension, which it is desired to eliminate, cannot be removed by condensation without simultaneously removing the hydrocarbon vapours of high tension, which it is desired to retain in the gas. Other physical or chemical means must, therefore, be employed to eliminate these compounds. Thus water, which has very feeble solvent action on the hydrocarbons, but a powerful affinity for ammonia, is employed to remove that gas. This water may be applied to the gas either in the liquid or gaseous form, as when the steam-scrubber is employed. When used in the latter form, we have again brought into play the law relating to the tension of mixed vapours and gases. Water in the gaseous form having no solvent action on the hydrocarbon vapours, acts towards them as if it were a permanent gas, the hydrocarbon vapours being diffused through the steam in similar proportion to that in which it is through the other permanent gases. Should the mixed vapours of steam, hydrocarbon vapours, and gases be very quickly cooled, the water vapour is in great part instantly precipitated, and the portion of the hydrocarbon vapour which was held in diffusion by it, not having the necessary time to transfer itself to the permanent gas, is also precipitated. Slow cooling allows this exchange to take place, and only the hydrocarbons, due to their limited solubility in water, are precipitated with the precipitated steam-water along with the ammoniacal gas. Here also we have illustrated the enormous effect of the water vapours when their tension is reduced to the liquefying point, causing a very large reduction of the vapour tension of ammoniacal gas or vapour.

The gaseous sulphuretted hydrogen, carbonic acid, and sulphuretted hydrocarbon compounds, being absorbed by hydrate of lime and its salts, the only matter now remaining in the purified gas, not eliminated, is water vapour. As the presence of this water would cause, by its sudden condensation, the precipitation of a portion of hydrocarbon vapour, Mr. Aitken proposes to remove it by the chemical affinity of oxide of calcium, or quicklime, for water; and by thus removing the water vapour at a comparatively high temperature, the hydrocarbon vapours are left in diffusion in the permanent gas.

Admitted, then, that naphthaline is produced only at high temperatures and in the retorts, it is evident that any process which would absorb or dissolve it out of the crude gases, during the process of condensation, would, according to Mr. Henry Aitken's views, obviate any necessity for the employment of a desiccating process, and that it would only be in the event of some form of condensation being employed which would prevent the naphthaline and other hydrocarbons from being removed that a desiccating process would be required.

Now, the process of Mr. Henry Aitken is just such a one. Instead of allowing the tars and gases to cool together, and thereby allowing the tars to absorb the naphthaline, as also necessarily a quantity of the vapours of the other volatile hydrocarbons, he removes the tars proper from contact with the gases whilst hot, and, by a fractionating process of cooling, saturates the gases to the fullest extent with the vapours of the most volatile hydrocarbons; and to enable the gases to retain those precipitable vapours, he dries them by passing them through lime; and, mark the reason why—because he had learned, by experiment and observation, that when water vapour was condensed and precipitated, a portion of the hydrocarbon vapours which he wished to keep in the gas was simultaneously condensed and precipitated.

Mr. Aitken does not desiccate the gases to prevent the precipitation of naphthaline alone, but from the first he has, to my knowledge, all along held that his process would prove a complete cure for the nuisance of naphthaline deposit; for the double reason that the denser naphthaline would be, so to speak, fractionated to the proper point out of the gases by the improved form of condenser, and there would also be diffused through the gas an extra quantity of the vapours of the liquid hydrocarbons, which act as solvents for solid naphthaline.

In short, the points of difference between the two processes are these:—Mr. Aitken's patented process is founded upon laws, and upon results which have fully verified those laws; while that of M. Brémond, on the other hand, is founded upon what is evidently an error, and for the prevention of that which does not take place—viz., the precipitation of naphthaline, which has been produced synthetically, from certain constituents in the gas, by the agency of the heat given out by the condensation of aqueous vapours.

Had M. Brémond given more careful thought to the extract of the report to the Board of Trade by the London Gas Referees, which he gives in his paper, it would have saved him from committing the blunder he has made, for it is there pretty clearly indicated that the presence and mode of condensing aqueous vapours from coal gas has an effect upon the condensing point of the other hydrocarbon vapours suspended in the gas. And a perusal of Mr. Aitken's specification would have shown him that he was committing a further blunder in attributing to Mr. Aitken any desire to lay claim to the discovery of the fact that the presence of aqueous vapour in gas reduced its illuminating power, the fact having been known long previous to the date of the report of the London Gas Referees, that water vapour reduced the illuminating power not only in the manner alluded to by "Selenium" in your issue of Dec. 11, but also by its undergoing decomposition during the combustion of the gas; the oxygen of the aqueous vapour combining with, and consuming, the carbon of the hydrocarbons at a temperature below that of incandescence, and thus also reducing the luminosity of the gas. Mr. Aitken makes no such claim. What he does claim to have discovered, or at least to have been the first to apply, is the fact that by desiccating gases they will sustain being exposed to a much lower temperature without a precipitation of the hydrocarbon vapours taking place.

Clippens Oil-Works, Paisley, Dec. 19, 1877.

WM. YOUNG.

#### THE REFEREES STANDARD BURNER FOR TESTING CANNEL GAS.

SIR,—In your issue of Nov. 27 last gauges are given of a standard burner for testing cannal gas, made, I suppose (though this is not stated), by the Chartered Company, which is of 20-candle illuminating power.



These gauges, though issued by the London Gas Referees for gas-testing purposes in their own district, will doubtless be taken, coming from so high an authority, as a guide for manufacturing test-burners, and for testing canal gas of the London quality in districts far removed from that City. For these, and other obvious reasons, it is important that the instructions should be intelligible and reliable. As they appear, looking from my stand-point, lacking in these features, I venture to ask the favour of your inserting the following remarks, which would have been penned much sooner, had not other pressing duties engaged my attention.

In order that I may be properly understood, permit me to quote the particulars given, which are as follows:—

*Cannel Gas.*

External diameter of top of stem . . . . .	Inch. 0.31
Internal diameter of stem . . . . .	0.17
Width of slit . . . . .	0.02
Depth of slit . . . . .	0.15

I assume that the gauges here given are intended—first, as a standard that meets the requirements of the Acts under which the Chartered Company's canal gas is tested, one of these conditions being that the gas should be consumed at the rate of 5 feet per hour, at 5.10ths pressure; and, second, as a guide to manufacturers who may have the burners to make, and to those who may have them to use.

The particulars regarding the depth of slit are indefinite, and do not convey a clear idea as to whether the depth of slit has been gauged from the top of the "external stem" or the top of the internal stem, and one can only assume that it is the former which is intended, from knowing that the depth of slit given, if cut through the internal stem, would consume nearer 10 feet per hour than the 5 feet required. But to gauge the depth of slit from the outside, when it is the depth cut through the "internal stem" that is required, is not the proper mode of procedure, even if a given depth of slit, gauged from the outside, always carried with it a given depth of slit through the internal stem. But there is no such relationship. Though the depth of slit gauged from the outside may be the same, the consuming power of burners can be varied, and is varied in the ordinary course of manufacture, to an enormous extent, by varying the thickness of material between the top of the "internal" and "external" stems. There are other particulars, which it would be too tedious to mention here, which materially vary the consuming power of burners, showing exactly one outside depth of slit; and seeing there is nothing to be said in favour of gauging from the outside, the "internal" stem can alone be considered the correct part to gauge for depth of slit. To what depth the "internal stem" is slit in the standard burner above particularized can only be assumed; but, allowing the same thickness of material between the top of the "internal" and "external" stems as is given for the sides, there will be a slit 0.08 inch in depth. This, with its width, 0.02 inch, through the internal stem, which is 0.17 inch in diameter, will make a bat-wing burner that will consume at 5.10ths pressure 7.14 feet per hour of 16-candle gas, and 6.86 feet of 20-candle gas, such as is made by the Chartered Company, instead of the 5 feet that I suppose is required to be consumed in testing that Company's gas.

The width of slit given, 0.02 inch, will cause a 20-candle gas-flame to smoke freely, and will not yield the most light from the gas consumed, and no maker who knows his business sends out a burner for that quality of gas with that width of slit.

If my remarks are based on a good foundation, the gauges given will require revising; if not, I shall be glad to have these remarks revised and put right.

Leeds, Dec. 21, 1877.

GEO. BRAY.

## Legal Intelligence.

### BACUP PETTY SESSIONS.—WEDNESDAY, DEC. 19, 1877.

(Before Mr. HOYLE, Mr. SUTCLIFFE, and Mr. MADEN.)

#### NON-PAYMENT OF LIGHTING RATES.

Mr. James Barcroft, of Edgeside, was summoned by Mr. Clegg, secretary to the lighting inspectors of Newchurch, for the amount of his rates upon two mills and his house.

Evidence having been called to prove that all the requirements of the Act had been complied with,

Mr. H. Stott, the collector, said that the defendant objected to pay because there was a road near to where he lived not yet lighted up, and said that when that road was lighted he would pay.

Mr. Clegg said that he and Mr. R. W. Munn had waited upon the directors of the Rossendale Union Gas Company as to the lighting of the road in question, and they had said they could not promise to lay the mains this season, as they were so busy in Rawtenstall and Clough Bridge, but next spring they would lay them.

Service of the summons having been proved, defendant not appearing, the magistrates made an order for payment.

An operative, named Trickett, was summoned for a rate made at the same time, amounting to 5s. 6d. The rate was for a year, but it was proved that the defendant had only lived in the house five months, and that the defendant's proportion would only be 2s. 3d., for which amount an order was made, the magistrates remarking that, as there had been an error on the part of the overseer, the defendant could pay the rate without the costs.

### CARDIFF BOROUGH POLICE COURT.—FRIDAY, DEC. 28, 1877.

(Before Mr. R. O. JONES, Stipendiary Magistrate.)

#### FAILURE OF A PROSECUTION OF A GAS COMPANY FOR ALLEGED DEFICIENCY IN ILLUMINATING POWER OF GAS SUPPLIED.

The Cardiff Gaslight and Coke Company were summoned by the Cardiff Urban Sanitary Authority for supplying gas of a less illuminating power than was required by the 17th section of their Act of 1870.

Mr. INGLEDEW, who appeared to prosecute, said the 17th section of the Company's Act prescribed that, unless prevented by unavoidable cause or accident, or during any necessary repairs, all the gas supplied by the Company should be of such quality as to produce from an Argand burner, having 15 holes and a 7-inch chimney, and consuming five cubic feet of gas per hour, a light equal in intensity to the light produced by 14 sperm candles, of six to the pound, burning 120 grains per hour. For the benefit of the public, it was provided by section 19 of the Act that "it shall be lawful for the Cardiff Board of Health, and any Local Board of Health within

the limits of this Act, to appoint a competent person, not being a member, officer, or servant of such Local Board, from time to time to make experiments as to the illuminating power and purity of the gas by means of any of the experimental meters and other apparatus before mentioned, and he may at any hour in the daytime, and not later than eight o'clock in the afternoon, either with or without the concurrence or presence of the manager or any other officer of the Company (but such manager or officer may be present if he so require), make experiment of the illuminating power and purity of the gas as before mentioned; and whenever such experiment shall be made at the Company's works, the Company and their officers shall afford all reasonable facilities for the making of such experiments, and if it shall be proved to the satisfaction of any two justices, not being shareholders of the Company nor members of such Local Board, after hearing the parties, that the illuminating power or purity of the gas supplied by the Company did not, when so tested as aforesaid, equal the illuminating power or purity by this Act prescribed, or that the Company or their officers refused to afford such reasonable facilities as aforesaid, or hindered or prevented the making of such experiment, in any such case the Company shall forfeit such sum, not exceeding £20, as the Justices shall determine." The cost of the proceedings, by section 20, was left in the discretion of the Justices.

The MAGISTRATE: There does not appear to be any notice of the testing required to be given to the Company.

Mr. INGLEDEW said no notice need be given of intention to test, when the testing took place at the works of the Company. If the testing took place at the Town Hall (which might be), then notice had to be given. In this case the testing did not take place at the Town Hall and therefore no notice was necessary. By section 18 it was enacted that "the Company shall, within six months from the date of the passing of this Act, cause to be erected and maintained in good working order, at each place of manufacture of gas, or station from whence the same shall be supplied, an experimental meter with an Argand 15-hole or other approved burner, and a seven-inch chimney, capable of consuming five cubic feet of gas per hour, with other necessary apparatus for testing the illuminating power and purity of all the gas of the Company; and it shall also be lawful for the Local Board of Health for the corporate district of Cardiff, at their own expense, and for the sole use of the said Local Board, their officers and servants, and the persons from time to time appointed by the said Local Board to test gas as hereafter mentioned, to erect and maintain at the Town Hall, Cardiff, or other convenient place near or adjacent thereto, a like experimental meter and other necessary apparatus for the purpose of testing the illuminating power and purity of gas as aforesaid." In this section they met with the expression, "or other approved burner," which did not occur in section 17, where the statute provided the standard of illuminating power. The standard was defined clearly by that section, and the means of ascertaining it were set forth. Possibly the Company might endeavour to show that, although on the present occasion the gas was not up to the standard of the illuminating power required when tested by a 15-hole Argand burner, yet they had provided another burner by which the gas would produce illuminating power in excess of that which was required by the statute. In this particular case the test was taken by a 15-hole Argand burner, such as was mentioned in the 17th section. He took it, therefore, that if he satisfied the Court that the illuminating power, as tested by that burner, was not equal to the illuminating power required by the statute, then the Company would be liable for not having complied with the provisions of the statute. In the present case Mr. Thomas, instructed by the Cardiff Urban Authority, went to one of the places of the manufacture of the gas, Grangetown, on the 23rd of November, and there tested its illuminating power, the result being that it was found to be below the standard prescribed by the 17th section. He (Mr. Ingledeu) proposed to call Mr. Thomas to prove this fact, and he would then ask in the interest of the public, for the infliction of such a penalty on the Company as would induce them in future to comply with the provisions of their own Act.

Mr. J. W. Thomas deposed that he was an analytical chemist, and had studied gas analysis. He was appointed by the Cardiff Urban Sanitary Authority to make experiments as to the illuminating power of the Cardiff Company's gas. On the 23rd of November he made experiments at the works of the defendants at Grangetown. He tested the gas at the time prescribed by the Act, before eight o'clock in the evening, by means of an Argand burner having 15 holes and a 7-inch chimney, consuming 5 cubic feet per hour. He had performed the test with the same meter previously; it was provided for the purpose of testing. The Manager of the Grange-town works (Mr. Evans) was present during the experiment, watched witness's readings, and was perfectly satisfied with them. Witness found the gas below the illuminating power prescribed (14 candles); the average of his tests showed it to be 13.63, which would make the difference in illuminating power rather more than a third of a candle.

Mr. NORRIS (who appeared for the Gas Company): Are you the Public Analyst appointed by the Urban Authority of Cardiff?

Witness: No; appointed by the Corporation.

And the Corporation are the Urban Sanitary Authority? You are the Public Analyst appointed by the Cardiff Corporation?—I believe by the Town Council.

At a salary?—Yes, at a salary—£100 a year.

Your appointment is made under the Sales of Food and Drugs Act, 1875?—Yes.

When were you appointed by the Cardiff Urban Sanitary Authority as Gas Inspector?—In October, 1876, I believe.

The MAGISTRATE: Then your appointment as Public Analyst was before?—I was provisionally appointed Public Analyst before.

Mr. NORRIS: You are paid a separate and distinct salary, I believe, as Gas Inspector?—Recently I have been.

The Corporation of Cardiff are the Cardiff Urban Sanitary Authority?—I should think not.

In what respect do they differ?—I cannot say.

Mr. INGLEDEW: It is a question of law; he cannot tell. I object to your taking an answer from him on that subject.

The MAGISTRATE: Are they a committee of the Corporation?

Mr. NORRIS: By the Act of Parliament of 1875 the Corporation and the Local Board of Health are made the Urban Sanitary Authority.

The MAGISTRATE: If that is the case, the Court will take notice of that.

Mr. INGLEDEW objected to the question being put to the witness, as it was a question of law.

Mr. NORRIS accordingly withdrew the question, and proceeded to argue that the witness was not a competent person to test the gas, as he was a servant of the Corporation. The Corporation must spend a little more money, and employ somebody else.

Mr. INGLEDEW did not agree with Mr. Norris's law, and argued that the Corporation and the Urban Sanitary Authority were different bodies for all practical purposes, having different funds to deal with.

Mr. NORRIS contended that the intention of the Local Act was clearly that the person appointed to test the gas should be somebody utterly and entirely distinct from the Corporation. The 18th section of the Act gave the Cardiff Urban Sanitary Authority power to erect and maintain for their exclusive use a meter for testing purposes at the Town Hall.



Mr. INGLEDEW maintained that the two bodies, the Corporation and the Sanitary Authority, had different and distinct offices, and different funds to deal with. Suppose the Town Clerk were to bring an action against the Local Board of Health, he, being an officer of the Town Council, must necessarily be nonsuited.

The MAGISTRATE said it seemed to him to be this: An officer was appointed by a body having a certain name, who, under another name, were really the same set of people. They called themselves black to-day and white to-morrow.

Mr. NORRIS, quoting from the Cardiff Improvement Act, said the Corporation were there described as the Sanitary Authority for the borough.

Mr. INGLEDEW repeated that the two bodies had to perform different functions, and to deal with different funds.

The MAGISTRATE: I have no doubt, looking at the spirit of this Act, that Mr. Thomas is, for these purposes, an officer who ought not to have taken the test. Therefore, unless you have any other evidence to produce that the gas was of bad quality, I must dismiss the case, with costs.

Mr. INGLEDEW said he had no other evidence to bring forward.

The summons was therefore dismissed.

## Miscellaneous News.

### ECONOMICAL USE OF COAL GAS.

On Wednesday evening, the 12th ult., Mr. SAMUEL HUNTER, C.E., Engineer and Manager of the Salford Corporation Gas-Works, delivered a lecture, in the Salford Town Hall, on "Coal Gas: Its History, Manufacture, and Economical Use."

The MAYOR (Alderman Walmsley) occupied the chair, and, in introducing the lecturer, said that during the comparatively short period Mr. Hunter had been manager of the Salford Gas-Works he had done more for the profit of the borough than had been done for many years in the past. Although Mr. Hunter found things in a very unsatisfactory state, he had managed his department so well as to give them a better gas at a cheaper price, and bring in the Corporation a better return. He must be a clever man who could not only give them a better article, but supply that article at a cheaper rate. The Corporation had rightly reckoned Mr. Hunter's services. No doubt he would that evening show them many interesting things in the process of manufacturing gas, and no doubt also the audience would be much better pleased to hear what Mr. Hunter had to say, and to witness what he had to show them, than to listen to any further observations from him.

Mr. HUNTER, after alluding to the discovery of gas, and the prejudices which existed against its use in the middle ages, said that a little over 200 years ago, in 1659, a Mr. Thomas Shirley, of Wigan, had his attention drawn to a ditch about a mile on the way to Warrington, the water of which was inflammable, and was considered one of the wonders of the world. Being an intelligent man, he made numerous exact observations, and sent an account of the whole matter to the Royal Society. It was not the water that was inflammable, but doubtless the then unaccountable production of flame came of the carburetted hydrogen of the underlying coal-field. The introduction of gas had given a thousand important impulses to our national industries. Like many other good physical blessings, it had proved itself also a capital moral agent. It had helped even to reduce crime, and Councillor Brown, speaking some time ago in the Council, gave it as his opinion that the more light we had in the streets the less crime they would have in the police courts. It was Winsor, a German or Frenchman, who started gas lighting in the Metropolis, but so little was the invention then understood and believed in by those who had not seen it in force, that even great and wise men laughed at the idea. "How could there be light without a wick?" said a member of Parliament, when the subject was brought before the House. The first shop lighted in London by the new method was Mr. Ackermann's, in the Strand, in 1810 or 1812, and one lady of rank was so delighted with the brilliancy of the gas-lamp on the counter, that she asked to be allowed to take it home in her carriage. Almost immediately after the splendid illumination of the Soho Steam-Engine Works, a move in favour of gas was made in Lancashire. At the close of 1804 a course of lectures on gas, by the celebrated Dr. William Henry, attracted the attention of some of the enterprising men of Manchester, and in a short time an energetic beginning was made by the late well-remembered Mr. George Augustus Lee. Mr. Lee was junior partner in the celebrated old firm of Salford cotton spinners, which, beginning in 1804 as Phillips, Wood, and Lee, shortly afterwards became simply Phillips and Lee. Their works, called the Salford Cotton Mills, counted as 52 and 53, Chapel Street, and for a long period were the largest in the district. At the present time the building was used as the bonding warehouses. By 1816 the current of public opinion had turned in favour of gas, and towards 1820 gas lighting became general all over England. In the latter year gas-works for the supply of the public were set on foot in Salford by a private gentleman, a Mr. Appleby. These were purchased in 1831 by the Police Commissioners—a local authority preceding the Corporation—for £6000. The capital invested in the Salford Gas-Works at the present time was £350,000. His (the lecturer's) notice of what Manchester had done must be taken as read, beyond stating that Manchester rapidly followed in the wake of Salford, one of the first places lighted being Birley, Hornby, and Co.'s mill, in Cambridge Street. After explaining, by means of diagrams, the method of manufacture, Mr. Hunter said that the distribution of gas was only second in importance to the manufacture. The gas having been made, purified, measured, and stored, the next object was to give to each and every consumer as much as he desired. He might here name one very important item, the leakage and loss of gas, or the difference between the measurement when made at the works, and the quantity paid for by consumers. This difference had now reached 85 million cubic feet per annum in Salford, and Salford was no exception to the general rule. This loss arose from causes easy to explain. The distributing plant was very extensive. The Salford district was a very wide one, extending nine miles in one direction from Lamb Lane, and the extent of the large main-pipes laid down in the streets and principal roads was between 160 and 170 miles. A matter of importance to the consumer was the meter, which indicated at the end of each quarter how much he had to pay. The measurement of gas by meter was quite as simple and as exact a process as that of the measuring of ale or porter. Two kinds of meters were in use—the wet meter and the dry meter. A meter correctly made was, within a reasonable margin, perfectly reliable. In order, however, that neither the maker of the gas nor the consumer should become a sufferer through want of accuracy in the measurement of the gas, an Act of Parliament stepped in. The percentage of variation that was to count in favour of either maker or user was fixed by statute. A perfect line was prescribed, but it was utterly impossible that any meter, the work of mortals, could always and infallibly keep true to it. The Act, therefore, required that meters should be so made as not to work at all, unless so accurate as never to show more than 3 per cent. against the consumer, or 2 per cent. against the maker. Having minutely explained the construction of meters, the lecturer said a dry meter might be perfect as far as comparative perfection went, and might

be preserved in good order for a length of time; but the balance of advantages was in favour of the wet meter, and the only solid reason why the dry one was preferred by some people was that it gave no trouble in connection with the water, and, in a certain limited sense, was a little cleaner. Neither of them was more blameworthy than the other, in regard to the "jumping" of the gas flame which sometimes occurred. He had endeavoured to point out the truth of what was often doubted—the reliability of the measurements made by the gas-meter—and he wished the consumers to understand that an overcharge was next to impossible, and that, whenever errors did arise from the imperfect working of the meter, they told more against the gas maker than the consumer. Having illustrated the method employed in testing the amount of light diffused by gas, he said that every one might feel assured that all the statements made by gas men as to the illuminating power of gas were made upon careful experiments, and that every one of them could be demonstrated to be indispensable. With regard to the comparative value and cost of gas-light in relation to the light furnished from other artificial sources, it was obvious that the value of gas to the consumer must be exactly in the ratio of its power to illuminate. Various materials were from time to time loudly vaunted as superior to gas for domestic purposes, particularly the cheaper kinds of oils, and that they were less expensive. People fell into the error of supposing that oil, because it burned so prettily when just lighted, and cost so much less to buy, was therefore better than gas. A greater mistake could not possibly be made. It was a delusion that oil was cheaper than gas. To get a flame from oil equal in illuminating power to a jet of Salford gas burning five cubic feet an hour, the difference against the oil was no less than 60 per cent. To put the matter in exact figures, a pint of oil burning for six hours, and giving a light equal to a flame of gas consuming at the rate of 5 feet per hour, cost 3½d., whereas the six hours consumption of gas would cost only 1½d., or 4-10ths of what was paid for the oil. Another frequent act of popular self-delusion was to suppose that gas must needs be cheaper when the price paid for it was lower. Price was no criterion as to the value of gas, unless the illuminating power was taken into consideration. In Salford the Corporation gave the public a better quality of gas than they would get in various other towns, and perhaps for less money. When gas was poor it was necessary to use more of it, so that in the end the cost added up to much about the same thing. To the consumer no point would be more interesting than the mode in which gas could be employed to the greatest advantage, which question involved primarily the consideration of the best kind of burner. Many consumers, through the use of ill-contrived burners, sacrificed no less than 20 per cent., and even 40 and 50 per cent., of the illuminating power of their gas, and then charged the manufacturer with supplying an inferior article. In Salford the Gas Committee told the public, and with perfect truthfulness, that out of a certain volume of the gas they sold there was involved a light equal to that of 20 candles, and any one might satisfy himself that it was so by visiting the photometer-room at the gas-works. What, he might ask, constituted a good burner? It must be so constructed that the supply of air was regulated. If sufficient air could not be obtained the gas smoked—that was, the solid particles of carbon did not get sufficient oxygen—and if too much air were supplied, the particles of carbon were burned too rapidly. The Argand burner was the best for illuminating purposes, the supply of air being regulated to the quantity of gas consumed. Whatever the shape of the burner or the width of the aperture, it was essential, in order to obtain the full amount of light, that combustion should take place, at the point where the gas first inflames, at a minimum or inappreciable pressure. Every one who was disposed to complain of a poor light should look into this matter, and ascertain how far it might be owing to bad burners. He might add that, in Salford, through the use of inferior descriptions of burners, consumers lost, upon an average, 33 per cent. of the light their gas was able to communicate. But all the blame should not be laid perhaps upon inferior or bad burners. Many people wasted their gas by allowing too great a pressure, whilst others used globes of a kind that impeded the light. With regard to the tricks imputed to gas managers, he said they were altogether groundless. A common charge was that air was pumped into the gas so as to dilute it, and thus cheat the consumer. Where such a notion could come from it was difficult to imagine, unless from some fancied analogy of gas with milk, and its dilution with water. In the Salford Gas-Works they had no "cow with an iron tail." To pump air into gas would be absolutely to destroy it as regarded its fitness for lighting purposes. In conclusion, the lecturer said that coal gas was unquestionably one of the greatest levers of modern civilization. It was impossible to look around and fail to see everywhere some illustration of the unspeakable good it had conferred on mankind. He doubted if its boundless capacity for usefulness was yet comprehended, or to what beneficent purposes it might be applied. They knew to some extent what it had already done for our manufactories and workshops, and our homes, but at present they could not say how much further it might go to foster or assist trading purposes by driving our machinery, or to what extent Winsor's wishes or imagination might be realized by the superseding of fire-grates and the abolition of fire-irons in our homes. How loudly the lover of gas complained in case he did not get all he desired, and his fondness for the illuminating agency often caused him to use it extravagantly. Not only could the gas manufacturer claim credit for the beautiful light so useful and so luxurious, but he was the producer of that so-called nasty, dirty tar from which the chemist extracted those beautiful aniline colours—mauve, magenta, and others—the adornments of female apparel, which in their beauty adorned the beautiful. From the distillation of coal we had the gas to give warmth or as a fuel for cooking purposes, or to drive our machinery, or the light to cheer and refresh, which made a "sunshine in the shady place;" we had also the sulphate of ammonia, which was of great value to farmers, and the liquor so useful to washerwomen. What more should he say for gas and its application to all practical purposes? The temple of our country's prosperity found in this useful product the "headstone of the corner;" it yielded precedence to no mechanical agent. We had our telegraphs, our steam-engines, our railways and canals; but without gas to illuminate, all other agencies must be comparatively in darkness. The great work of our Almighty Creator was without "form and void" until he gave the crowning command, "Let there be light." Let us rejoice that our business and home, yea, life itself, had been made more enjoyable by the practical application of gas.

At the close of the lecture a cordial vote of thanks was given to Mr. Hunter, and a similar compliment was paid to the Mayor for presiding.

EXETER WATER COMPANY.—At a meeting of shareholders, last Wednesday, it was agreed to accept the offer of the Town Council, and the Directors were empowered to complete the sale of the undertaking to that body.

PRESENTATION TO MR. CHARLES FARRAND.—The officers and other employees of the Croydon Gas Company have presented to Mr. C. Farrand a handsome silver cup, bearing an appropriate inscription, on the occasion of his retirement, through illness, from the position of manager of the Company, which he had held for upwards of 21 years.

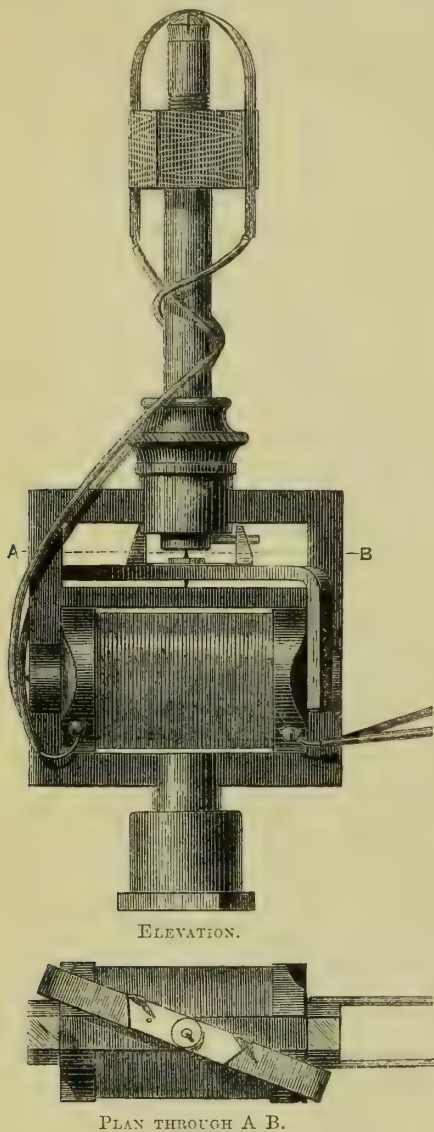


## LAMP LIGHTING AND EXTINGUISHING BY ELECTRICITY.

The accompanying engravings exhibit a front elevation and plan, through the line A B, of an apparatus devised by Mr. St. George Lane Fox, the object of which is to enable any desired number of public or other gas-lamps to be lighted or extinguished simultaneously.

Some months ago Mr. Fox obtained permission to test the merit of his invention upon a number of lamps at the Fulham station of The Gaslight and Coke Company, and has done so with results so far satisfactory that we believe the experiment will be continued during the whole of the present winter.

The means whereby the inventor effects his object consist, in the first place, in connecting together the lamps to be operated upon by means of insulated metallic wires, so that an electric current, generated at one point or station, can act simultaneously upon every lamp through the instrumentality of the apparatus here exhibited.



This apparatus consists chiefly of a soft iron core, around which is a coil of insulated wire, thus forming an electro-magnet. The wire of this electro-magnet forms part of the electric current by which the lamps are connected. Around this primary coil is wound a secondary coil of fine wire of much greater length. Above these coils is a permanent steel magnet, free to turn on a vertical axis. These magnets are carried in a small rectangular metal framing, cast or made with a hollow core, and having a cylindrical portion at top and bottom, the lower one being screwed upon the gas inlet-pipe which supports the apparatus, and the upper one receiving the stopcock. This cock is composed of a brass tube, having two openings corresponding with passages on the opposite sides of the rectangular frame. The plug of the cock is made with a very slight downward taper, having two apertures or ways corresponding with the openings in the tube, and is hollowed out in the middle. When the gas is turned on, these apertures come opposite the openings, thus giving a free passage for the gas from the inlet-pipe through the two sides of the rectangular frame, and into and through the plug. The plug is supported on the point of the pivot on which the permanent magnet swings, so that very little power is required to turn it. The magnet itself has cast upon it two projecting pieces of metal and the lower end of the pivot on which it turns, rests in a steel step supported by a small wooden beam secured to a wooden bobbin at each end of the induction coil. The primary wires form part of the circuit by which the lamps to be lighted or extinguished simultaneously are connected. One end of the secondary coil is connected to an insulated wire leading to the gas-burner, where it terminates in a platinum point; the other end is connected to the rectangular frame, or to any other metallic part of the apparatus, so as to be in metallic connection with the burner. This insulated wire passes through an earthenware support fixed to the outlet-pipe.

The action of the apparatus is as follows:—Upon an electric current from a magneto-electric machine, or other suitable apparatus, being sent through the circuit which connects the whole series of lamps, the soft iron core in the apparatus attached to each lamp becomes magnetized, the effect of which is that the permanent magnet is caused to turn on its axis. When it has made about one-third of a revolution the projections thereon strike against a pin, which passes through the bottom of the plug of the cock, so that the plug turns with the magnet for the remainder of its movement, and thereby turns on the gas. The ignition of the gas is effected as follows:—One end of the line having been connected to one of

the armatures of a condenser of very large surface, the condenser is charged to an electro-motive force of several thousand volts or units by means of a Rhumkorff coil. The other end of the line is connected with any suitable mechanical arrangement, by which, when it is desired to ignite the gas, contact is made with the other armature, and then instantly broken. A powerful current is thus set up which ceases abruptly, the result being that a secondary discharge takes place at each burner, the lamp being thereby ignited.

When it is required to extinguish the lamps a current from the magneto-electric machine is again sent through the circuit, but in an opposite direction. The permanent magnet of each lamp is thereby caused to return to its former position, and in doing so it again acts on the pin, and turns off the gas.

## THE FAILURE OF THE GASHOLDER-TANK AT MIDDLESBROUGH.

By Mr. JOHN CHATTO.

[The substance of a Paper read before the Cleveland Iron Trade Foremen's Association.]

Having been requested to read a paper before this Association, I thought I could not do better than direct your attention to a recent engineering work undertaken in this town, which has been, and I believe still is, a source of great anxiety to the parties directly concerned—viz., the construction of the new gasholder-tank for the Corporation of Middlesbrough. This tank is 183 feet in diameter and 30 feet in depth. I may mention, for the information of those who are not acquainted with the particulars, that the wall of the tank was completed for some 20 feet in height when the internal excavation for forming the cone at the bottom of the tank was commenced. It was at this time that the wall collapsed, causing a row of adjacent houses to give way, so as to render them unsafe for habitation, some of the cracks being as much as 6 inches wide. Since the suspension of the works the excavation has filled with water to within a few feet of the top. In the months of March and May, 1876, Mr. Cail, of Newcastle, and Mr. Livesey, of London, were consulted as to the best mode of repairing the damage, and carrying on the work successfully.

With respect to the damage done by the failure of this tank, and the responsibility arising therefrom, it is not my intention to say anything. I propose simply to deal with the question from an engineering point of view. And first with reference to the site of the tank. The position chosen for its erection has several points to recommend it. It offers facilities for receiving and delivering materials by rail, in the event, at some future time, of its being deemed advisable to erect a retort-house near the spot. In a sanitary view also, the selection is well made, as in this locality it is not likely that a superior class of houses will ever be erected there. In the third place, as it is near that part of the town which is to be supplied with gas, the cost of mains will be reduced to a minimum. Fourthly, it is well adapted for utilizing the ascensive power of the gas, thus avoiding the necessity for heavy pressure at the holder, and reducing the consequent loss by leakage. And, fifthly, the cost of the land was less than any other that could be bought suitable for the purpose.

*Geological Features of Middlesbrough.*—The town of Middlesbrough may be considered as being a miniature peninsula, being surrounded on three of its sides by the River Tees. The soil is formed from drift of the recent period, there having been found, during the excavation at the site before mentioned, antlers, sea shells, and the frontal part of a human skull.

This formation, I believe, has accumulated from two different sources—viz., that on the north-east side from the flow of the tides carrying with it sand from the sandy cliffs and shore, which are very prominent at the mouth of the river, while that on the west side has been derived from the superficial waste of the adjacent hills, caused by the heavy rains, and which has been carried by the current, and deposited at this particular spot. The river at this part is shaped like the letter V with the point rounded, the current at Newport running east, at which place it abruptly changes and runs due north. Thus nearly all the sediment brought down is deposited upon the Middlesbrough side, while the encroachments are at Newport and Haverton Hill. At the latter place the river again suddenly changes its course, and runs in a south-easterly direction until it reaches the dock entrance channel, and from that place to the bar may be considered as the mouth of the river. The sediment carried by the tides is also deposited upon the Middlesbrough side. It will be readily understood from this description that if the river had been left to its natural course its position would have gradually shifted still more, by encroaching and forming deep water on the Haverton Hill side, while the channel at the Middlesbrough side would become shallower, being destined eventually to be converted into land. The river at this point may in all probability have been nearly straight at one time, and we may attribute its present course to the lias formation, which is seen at Boulby Cliffs to great advantage. The three divisions—viz., the upper, middle, and lower lias—are all exposed to view, and traverse the coast as far as Huntcliff, near Saltburn, at which latter place they disappear, but are found again opposite Redcar, and may be seen at low water. From this point they run across the mouth of the river, where workmen, some time ago, were employed to blast lias away. From this point up the river the formation is broken, so that there is no regular stratum under the Middlesbrough drift; for the lias, as seen at Boulby, passes away into the interior of the country, which it traverses in a south-westerly direction, and at the same time rising considerably. Its elevation at Eston Nab is about 600 feet. I may here mention that it is from the middle division or Marlstone series of this lias formation that the ironstone is obtained in such great quantities.

It will now be understood that as the tides gradually deepened the river mouth, the channel also gradually shifted towards the north side, while the south side was protected by the escarpment of the lower lias before mentioned, which dips to the north side, the water always encroaching on those parts which offered the least resistance. From these considerations, I believe that the formation of the Middlesbrough drift is due to the shifting of the river mouth, caused by the lias formation at this place. We will now examine the Middlesbrough drift as suitable for heavy foundations.

The greatest depth attained is at Bolckow, Vaughan, and Co.'s works, the boring of which presents the following strata:—

	Feet.
Mud, loamy sand, and clay . . . . .	58
Rock mixed with clay . . . . .	12
Rock mixed with gypsum, including two beds of gypsum of 2 feet and 6 feet respectively, also the new red sandstone .	69
Salt { Very dark 4 feet 1 inch	
" 39 feet 11 inches	
" light 9 feet . . . . .	100
" 47 feet . . . . .	

The salt is supposed not to have been bored through. The above strata cannot be taken as a guide for foundations at any other part, for it is well known to local engineers that the drift varies continually, and where the engineer has failed to gain a good foundation for his work in one place, he has found it in another not more than 30 or 40 yards distant. Piles have also been driven to a great depth without success; therefore, the only reliable information is that gained either by sinking staples or boring.



With reference to ground at site, Mr. Cail had a staple sunk to a depth of 56 feet below the surface, the strata of which are as follows:—

	Feet.
Clay . . . . .	4
Loam . . . . .	10
Peat . . . . .	4
Clay and vegetable fibre, and which we will call, for convenience, vegetable clay . . . . .	38
Giving a total in feet of . . . . .	56

**Concrete Gas-holder-Tanks.**—Concrete tanks, with a lining of brickwork, appear now to be generally recognized as being the cheapest known construction suitable for this purpose. The first concrete, or more properly composite, tanks were constructed with a double brick wall, the space between them being filled with concrete. The next step in advance was to leave out the back brick wall, and in 1874 a tank was constructed at the South Metropolitan Gas-Works, the dimensions of which were 184 feet in diameter and 47 feet in depth, entirely of concrete. Neither brick, iron, stone, nor puddle was used, the interior being coated with a skin of Portland cement to make it water-tight, the foundations being on the London chalk. This tank was completed and filled with water, when it was discovered to be cracked from the top to the bottom, the crack being about one-sixteenth of an inch in width. Afterwards four more cracks appeared in different parts. However, the gas-holder was put to work, and has continued so ever since, the loss by leakage of 6 inches in depth of water in 24 hours being supplied from the works. From this circumstance we may come to a conclusion that tanks built entirely of concrete are not to be relied upon. The foundations in this case were on the chalk, therefore no settlement could take place, and the cracks must be attributed to the weakness of the wall.

I have come, then, to the conclusion that tanks with a brick lining are preferable, as the lining can be built forming the inner circle to a nicety, and if built three or four courses in advance, the concrete can be laid with little trouble. The brickwork should be bonded with the concrete at intervals, although this is not thought necessary by some engineers. Taking into consideration that concrete is stronger than brick, this appears feasible; nevertheless, I prefer the work bonded, because the additional security afforded thereby, in case the lining should have a tendency to leave the concrete, covers the additional expense.

In order to strengthen the concrete while new, layers of hoop iron should be laid all round at about every four feet in depth, and, to protect the iron from rusting, it should be bedded in neat cement. It must be remembered that concrete will leak like a gravel bed, and that cement with ever so little sand mixed with it is porous. Concrete with one part Portland cement, two of sand, and four of gravel, or any other suitable material, when properly worked, is stronger than brick and cement, the ratio being about one-third. It requires great care and experience in its manipulation, also a good aggregate, and the selection of a good cement, together with constant supervision; for, of all building materials, concrete seems to be the only one which defies the engineer in judging of its quality by appearance, while the others can be judged by their colour, weight, texture, fracture, and sound.

As the strength of concrete mostly depends upon the quality of the cement, great care and judgment are needed in making a good selection, and amongst the several kinds used for the purpose, Portland cement stands first. It is composed of clayey mud and chalk ground together, and afterwards calcined at a high temperature, after which it is ground to a fine powder. Old cement is preferable, as it increases in strength if kept from moisture. Its resistance to compression is about double that of any other ordinary building stones, being about 336 lbs. per square inch; its tensile strength is 300 lbs., and it should weigh from 115 to 118 lbs. per bushel. Its goodness also depends a great deal upon its fineness, and by a little practice this can easily be ascertained by pressure between the finger and thumb. The colour should be rather of a light-bluish grey; if it is very light there is too much free lime, and if rather dark there is too much clay in its composition. The lime causes expansion, but this may be remedied by exposing the cement to the air for some 24 hours before being used, especially new cements; while in the case of excess of clay, the cement sets more quickly, and is considerably weaker. Of the two evils, therefore, the lime is the less, and it follows that a slow-setting cement is the strongest.

The method of testing for tensile strength is to form bricks from the cement mixed with as little water as possible, which at the end of a month are placed in a machine made for that purpose. The test for expansion is made by filling a strong glass bottle, without ramming, with the cement mixed as above, and if in 24 hours the bottle is not cracked, it may be passed. The test for fineness it made by placing the dry cement in a sieve of 2500 meshes to the inch, and if 80 per cent. passes through it may also be passed. Too much care cannot be taken in testing the cement, for, if bad cement is used, it is not only useless in itself, but also the money expended on other materials, and labour in connection with it, is completely thrown away.

With reference to the materials used for mixing with the cement, these should be of a porous nature, and, for this purpose, broken clay retorts stand first. Well-burnt bricks come next, and then clean gravel and sand. Particular attention must be paid to the rejection of all materials of a soft and loamy nature, as well as those containing vegetable matter. I think, in the present case, that the slag obtainable at the site may be used with advantage on the score of economy, providing that it is broken into pieces not exceeding 2½ inches, as iron slag, generally speaking, cannot be classed as a porous substance. By reducing the slag to a small size, the cement will be distributed over a larger surface, and thus the few pores and angular shapes that it may contain are utilized, and a homogeneous mass is formed. Layers or packings of large pieces should be avoided, or, if used, the cement should be increased to three parts, and care must be taken to surround them with smaller material, so as to fill up all interstices.

It must also be borne in mind that slag is much heavier than ordinary concrete, the difference being as 1·64 is to 3·37 tons per cubic yard. The ground will have, therefore, this extra weight to bear, and this is a point which requires consideration in the case of weak grounds. It is immaterial whether the water used for mixing is salt or fresh; but the quantity should be as little as possible, being just sufficient to thoroughly moisten the mass, and care must be taken to have a proper supply for this purpose, for if insufficient, the cement will not set properly, and the whole concrete so mixed will be useless. The materials should be thoroughly soaked in water until required for use, and before placing a fresh layer, the previous one should be examined and freed from all foreign deposit that may have collected on it. It should then be made thoroughly wet, and in case the work should be drowned by the trenches getting filled with water from heavy rains, or otherwise, on the recommencement of the work the top should be thoroughly washed to cleanse it from the deposit of mud which will have collected; the next layer can then be laid.

In laying the concrete, it should not be shot from a height, for by so doing, the heavier parts fall in a heap together, and to a great extent separate the cement from the other parts. It should be gently laid and spread at once, then lightly rammed.

The depth completed per day may be about 9 inches, and should not exceed 12 inches. The work will increase in strength by age. It has been found from experience to be, at 112 days old, as follows:—

Pure cement . . . . .	increases 36 per cent.
One cement and one of sand . . . . .	60 "
One cement and four of sand . . . . .	200 "

By chemical analysis, good Portland cement has been found to be of the following composition:—

Insoluble in acid . . . . .	33 per cent.
Alumina and oxide of iron . . . . .	14 "
Lime . . . . .	50 "
Moisture, &c. . . . .	3 "
Total . . . . .	100 "

Our next consideration will be the cause of failure.

With all due deference to the opinions of Messrs. Cail and Livesey, I am, however, under the impression that the direct cause of failure has not yet been given, and which I now state as my opinion to be entirely due to the drainage of the surface water, and which I will now endeavour to prove. In the first place, I have practically tested the sustaining power of the ground in question, the samples chosen are those taken from between the peat and the vegetable clay; and in order that there shall be no mistake on this head, they are now on the table before you. The testing was conducted in the following manner:—

Estimated weight of the coal depôt building and 4 feet slag foundation, together with slag wall which has fallen = 508 tons.

This weight distributed over an area of 600 superficial feet =  $\frac{508}{600} = .846$

of a ton per square foot.

The slag varies in weight; the piece on the table was taken from the site, and weighs 5 lbs., which displaces 27·55 cubic inches of water; 1 cubic foot of slag will therefore weigh  $\frac{5 \times 1728}{27.55} = 313.6$  lbs.

The sample was then pressed firmly in a perforated cylindrical vessel 4½ inches deep, the outside being wrapped closely with hemp, which prevented any of the soil from escaping, while it left room for the water to drain off. On the top of this was placed a piece of wood 4½ inches in diameter, which fitted loosely in the vessel, and on the top of this

again was placed a direct weight of  $4.125^2 \times .7854 \times .846 = .0785$  of a ton = 175.8 lbs. This being the proportional weight of the building, the following is the rate that the ground sank:—

In 12 hours . . . . .	$\frac{5}{8}$ of an inch.
24 " . . . . .	1 inch.
48 " . . . . .	1½ "
96 " . . . . .	1¾ "
168 " . . . . .	1⅝ "
336 " . . . . .	1½ "

After which it appeared to stand for the next fourteen days. If the ground, therefore, had been excavated all round the building to a depth of the bottom of the peat, then by this proportional (4·75 : 48 :: 1·5) the building would have sunk 15 inches. But in this case we have only one side of the building exposed to drainage, caused by the excavation; therefore we have

as  $\sqrt{600} : 24 :: 24 : 15$ ; then  $\frac{15}{24} = .625$  or  $\frac{5}{8}$  inch, and which I have no

doubt will be found to be the vertical settlement of the building if measured.

Again, with reference to the cracks in the buildings, taking one that is 6 inches wide at the top, at the first sight the general impression is that the ground has slid away, but on investigation we find that it has done no such thing, for in looking towards the bottom we find that the crack there is only 2 inches wide, and if the same crack be examined to the bottom of the 4-feet slag foundation, I have no doubt that it will be found to diminish to nothing, or nearly so, while the ground will not show any crack. These cracks are, therefore, due to the diminishing bulk of the ground, caused by the abstraction of the surface water, which does not take place equally, but is greatest near the edge of the excavation, and diminishes in the ratio as the square of the distance; therefore the settlement of the ground will be in the form of a parabola.

Referring again to the sample before mentioned, we find that it has reduced in bulk from 4½ inches to 3½ inches in depth, thus giving a loss of (4·75 : 1·5 :: 100) = 31·5 per cent. Then the stratum of peat being 48 inches, this is = (100 : 31·5 :: 48) = 15 inches; but taking into consideration the distance that the excavation is from the weight—viz., 15 feet to the building and 30 feet to the crack—we will, therefore, have (30 : 15 :: 15) = 7½ inches, or 15·75 per cent. as the settlement of the ground at the edge of the excavation, which is found to agree exactly with the crack in question, for the top of the crack and the ground between the excavation having been set off to the same radius, the difference of each is found to be equal—viz., the crack is 6 inches wide, and the ground has sunk 6 inches.

The next test was the sustaining power of the water in the peat, the sample, weight, &c., being the same as the above, and was pressed firmly in a cylindrical vessel which was not perforated, and a weight of 224 lbs. being placed on the top, in 30 minutes it sank one inch; the weight was then taken off.

In 7 minutes it rose . . . . .	$\frac{5}{8}$ of an inch.
15 " . . . . .	1 inch.
2 hours " . . . . .	1½ "
6 " . . . . .	1¾ "

after which it appeared to stand for the next seven days.

The next test was to ascertain the quantity of water contained, the sample being the same as the above in every respect, and weighing 2½ lbs., and after being placed on the kitchen chimney-piece for 28 days it was found to weigh 8½ ounces, thus giving (80 : 63 :: 100) = 78·75 per cent. of water. The next is a sample of Linthorpe clay, which has been subjected to the same process as the above peat, and has diminished in weight from 3 lbs. to 2½ lbs., thus giving (48 : 36 :: 100) = 75 per cent. of water, and is therefore (78·75 : 62·09 :: 100) = 78·84 per cent. better adapted for foundations.

Thus it is clearly shown that the vertical settlement was sufficient to produce damage to the property, supposing the ground not to have moved forward, therefore piling and timbering would not altogether have saved it. I grant that if the part near the buildings had been properly timbered it would have stayed the slip mentioned in Mr. Livesey's report; but before proceeding further let us examine the cause of this slip. I have already shown that this ground diminished in bulk at the edge of the excavation at the rate of 15·75 per cent., and that this quantity decreased as the square of the distance. We have seen also from the strata that it is mostly of a peaty nature, and deficient in alumina, which is so characteristic



in clay. Then, for argument, we will take the block of buildings at the corner of Francis Street, which are joined together as one mass, and rest upon some 4 feet of slag, which, in its turn, is, as it were, floating on the ground described; the surface water being gradually drained by the excavation. In the meantime the ground above keeps its position, for the weight of the nearest building is supported by the next one to it, and in this manner the buildings are being gradually undermined by the loss of the sustaining power of the water, and this continues to go on until the weight of the projecting building equals the resistance of its materials, the consequence being that the weight then comes suddenly upon the some-time undermined ground, and compresses it almost to its original density, which compression will be exactly the same as the bulk or volume of water that has been taken away from it. I have no doubt that if no buildings had been near, the ground would have given way from its own weight at some later period. Therefore this slip is due to the drainage of the surface water.

To sum up, the failure was caused by the continual loss of the sustaining power of the water under the buildings, and thus reducing the gravity of the ground until the projecting buildings were strained beyond the adhesiveness of their materials, and consequently parted. The whole weight of the dislocated buildings (about 900 tons) falling suddenly for a depth of five-eighths of an inch upon the now lighter ground, caused it to give way, and by so doing put about 800 tons of earth into motion, making a total of 1700 tons; therefore the actual pressure against the wall would be =  $F \sin \theta$ . This angle is found by taking the distance from the parted brickwork and the bottom of the peat, which gives an angle of  $20^\circ$ ; we have then  $F \sin \theta = 1700 \times \cdot 342 = 581$  tons as the pressure exerted on the ring of concrete walling. This being of an insufficient strength to resist such an unexpected pressure, it broke, and was subsequently carried forward until the angle of repose of the ground was reached. Therefore the failure was caused by the drainage of the surface water.

We will now consider the proposed plans for avoiding a failure in future. It is quite evident that neither Mr. Cail nor Mr. Livesey anticipates any difficulty from the surface water, for neither gentleman has provided for this emergency in his plans. I, nevertheless, still hold to my opinion, and I have no hesitation in stating that I believe, when the excavation has been cleared from water for a short time, the buildings will settle still more. No doubt a system of strong piling will assist their stability and prevent slip.

With regard to the scheme of building a smaller tank in the interior of the present one, I cannot see that it shows any engineering tact, although, no doubt, a smaller diameter with the same thickness of wall would be stronger; but that would be sacrificing the capacity of the tank for the purpose of utilizing a broken wall, which is of no use whatever, for, being completely broken at that side near the buildings, it offers them no protection, while at the opposite side, no buildings being near, the wall is quite sound, which simply shows that in building the new wall no assistance will be required from the old one.

Again, both gentlemen suggest that the new tank should be increased in depth, which is a decided improvement. The depth of tanks having been duly considered, both by the members of the Institution of Civil Engineers and the members of the British Association of Gas Managers, it was found that a depth of less than one-fifth of the diameter was not desirable; for gasholders less than one-fifth are liable to get out of level, and consequently stick, and thus cause great annoyance.

With regard to carrying the tank above the ground level, I consider the plan to be bad, and should only be resorted to in cases where it is expensive or difficult to sink the foundations; for instance, such as hard rock. Tank walls above ground are difficult to keep tight, and are more exposed to the wind.

With reference to the supporting power, Mr. Livesey's plan depends at once upon the area of the base of the wall, for the backs being made up with artificial ground no supporting power from the sides will ensue. Now it is well known to engineers that vegetable clay cannot be relied upon for heavy foundations without assistance, which is obtained by piling down to a firmer stratum, or by the supporting power gained from the frictional resistance of the surface of a number of piles. With reference to Mr. Cail's plan, he appears to be under the impression that a partial upheaval took place in the tank. If so, the line of inclination would be below the bottom of the foundation, and at an angle of  $85^\circ$ . To meet such circumstances Mr. Cail's scheme cannot well be surpassed, but I find from inquiries that no upheaval took place, and such being the case, the line of inclination must be somewhat above the bottom of the foundation. I have already taken this line at  $20^\circ$  in a previous calculation, and my reason for doing so will be quite apparent on examining the nature of the ground, for in all probability it would give at an acute angle from the surface to the peat, and then run along the peat until it reached within a short distance from the edge, from which point it would again run in an acute angle towards the bottom of the foundation. The resistance to lateral strain would therefore be best served by a strong footing and strengthening uprights at intervals.

It must also be borne in mind that, in sinking a foundation to a greater depth, the additional weight of the material as well as the stratum must be considered. Taking one of the cylinders mentioned in Mr. Cail's report as an example, in the first place we find that the bottom of the cylinder is in the same stratum, therefore the supporting power at its base must be the same. Thus it is evident that the only power gained will be that derived from the frictional resistance of its sides, which will be for the ground in question  $\cdot 2$  of a ton per square foot.

We have then for the brickwork round the cylinder—

$$\frac{(7 \cdot 5^2 \times \cdot 7854) - (6^2 \times \cdot 7854) \times 14}{27} \times 1 \cdot 35 = 11 \cdot 133 \text{ Tons.}$$

and for the concrete in its interior we have—

$$\frac{6^2 \times \cdot 7854 \times 14}{27} \times 3 \cdot 37 = 49 \cdot 406$$

$$\text{Giving a total of non-supporting power in tons} = 60 \cdot 539$$

and for the frictional resistance we have—

$$7 \cdot 5 \times 3 \cdot 1416 \times 14 \times \cdot 2 = 65 \cdot 973$$

$$\text{Giving a gain of supporting power for each column} = 5 \cdot 434$$

$$\text{or } \frac{5 \cdot 434}{329 \cdot 8} = \cdot 0164 \text{ of a ton per square foot.}$$

Assuming, therefore, that a firmer stratum cannot practically be reached, the supporting power would be better served by timber piles, for, in driving piles, the whole of the material driven through is compressed on all sides, whereas, in sinking cylinders, the material is excavated from their interiors. Besides, timber piles have a great tendency to adhere, or grow, as it were, to the earth, and are also much lighter in themselves. From these considerations, I think we may safely assume that the surface

friction of piles will be one-fourth greater than cylinders, and taking a cubic foot of Memel to weigh 34 lbs., we have for frictional resistance—

$$\begin{aligned} 1 \times 4 \times \cdot 25 &= 1 \cdot 0000 \\ \text{Then minus the weight of pile per foot run} &= \cdot 0151 \end{aligned}$$

$$\text{Total per cubic foot} = \cdot 9849$$

$$\text{or } \frac{\cdot 9849}{4} = \cdot 2462 \text{ of a ton per square foot. Showing a gain of supporting power in favour of timber piles of } (\cdot 2462 : 2298 :: 100) = 93 \cdot 3 \text{ per cent.}$$

I now wish to call your attention to a plan that I have designed, which will be found to have the following advantages:—1. Of overcoming all obstacles. 2. Of avoiding pumping, so that the safety of the adjacent buildings is secure. 3. Of being more permanent and durable, the weight on base per square foot being nearly one-half less than the other schemes proposed. 4. Of being as cheap as the other schemes, capacity compared. 5. Of being of the original diameter, so that no extra cost will be incurred by the alteration in the diameter of the holder. And, lastly, but not least, the reputation of Middlesbrough engineering would not be at stake by submitting to such an ordinary difficulty.

The proposed tank is rectangular in shape, constructed of cast-iron plates, bolted together with bolts an inch in diameter, all joints being made with iron cement. There are 10 tiers of plates on the outer circle, and seven on the inner circle, each tier having 114 plates in its circumference. The outer and inner bottom tiers are  $1\frac{1}{2}$  inch thick and 18 inches in depth. These tiers form the shoe, the next outer and inner tiers are  $1\frac{1}{2}$  inch in thickness, the circumferential flanges of which are 12 inches wide, the bottom one being for the purpose of resting on the bearing beams attached to the piles; and the top one being for the purpose of bolting the tier and bottom plates thereto, so that the bottom plates can be removed independently when required. The width of these flanges is designed for resisting lateral pressure. The bottom plates are in two lengths across a width of 11 feet, and are  $1\frac{1}{2}$  inch thick, the remaining outer and inner tiers are 1 inch and three-quarter inch respectively. Round the inside of the outer circle are 24 U columns 4 feet 9 inches by 4 feet 9 inches and 1 inch thick, which are placed at equal distances apart, each U being cast in two parts, and corresponding to the tier plates in depth, and are bolted thereto and together by 1 inch bolts, the flanges of which are left off at the corners at an angle of  $45^\circ$ , so as to span the circumferential tier flanges. The vertical centre flanges form at once girders for fixing the guide-bars thereto, and on the tops are bolted sole-plates 5 feet 9 inches by 5 feet 9 inches and  $1\frac{1}{2}$  inch thick, for the purpose of receiving the columns. The U columns before mentioned also form the strengthening uprights for resisting lateral pressure. At the first joint from the top of the inner circle a flange is provided on its inner side, to which is bolted a ring of woodwork 9 inches by 3 inches, and on the top of this again is built a brick and cement wall 2 feet 6 inches in depth, thus by these means securing a tight joint. The interior of the tank is excavated to the bottom of the peat, after which a layer of tempered clay 4 feet in depth is laid on the top, and then a layer of concrete 15 inches thick; upon this again is bedded a top covering of a brick on edge in cement. The brickwork is strengthened at the corner in such a manner that any settlement in the interior will not affect the joint or crack the covering. The inlet and outlet pipes are in the tank, the bottom plates for two widths being dished, so that the pipes lie clear of the bottom of the holder. The tank is 193 feet 6 inches and 171 feet 6 inches in diameter respectively, and 36 feet in depth clear, and can be erected upon the top of the present wall, the outer and inner circle overlapping each side of the wall, the bottom division, forming the air chamber, being completed, and having fitted on the top two air locks, two water shafts, and two supply-pipes. Underneath the bottom flange, and resting on the wall at intervals are bearing beams, which will regulate the lowering of the structure, the next tier being added as the work progresses. Fixed to each U column are three temporary brackets for the purpose of keeping the tank in a proper form. When the tank has been sunk to a sufficient depth, so as to be clear of surface water, which can be proved by reducing the air pressure occasionally, one width of bottom plates at each side of each U column can be taken off, and the excavation completed in the usual way. The piles can then be driven, after which the whole air chamber can be filled with concrete, thus forming at once a ring of the section of 11 feet by 7 feet 9 inches, which is sufficient to resist any lateral strain that may come against it. The holes in the bottom plates for air-locks, &c., can then be covered with blank flanges.

With reference to the comparative weights on base of foundations, I have assumed that Mr. Livesey's wall is as shown on drawing; the dimensions I have gathered principally from his report. The weights are calculated as follows:—

Mr. Livesey's.		Tons.
Brickwork lining		1204
Concrete		7075
Water		1768
20 columns		313
Wheels		20
Brackets and guide-bars		17
Girders		9
Balance-weights		50
Roof girders		30
Holder		190

$$\text{Giving a total of} = 10,676$$

$$\text{Then we have for weight on base } 175^2 \times \cdot 7854 - 155^2 \times \cdot 7854 = 5183 \text{ square feet. Then } \frac{10,676}{5183} = 2 \cdot 059 \text{ tons per square foot.}$$

Mr. Chatto's.		Tons.
Ironwork		1364
Concrete		5709
Water		6343
24 columns		375
Wheels		24
Brackets and guide-bars		21
Girders		10
Balance weight.		57
Roof girder		36
Holder		240
Bolts		44

$$\text{Giving a total of} = 14,223$$

Then we have for supporting power from side—

$$\begin{aligned} 193 \cdot 5 \times 3 \cdot 1416 \times 26 \times \cdot 2 &= 3161 \\ 171 \cdot 5 \times 3 \cdot 1416 \times 26 \times \cdot 2 &= 2801 \end{aligned} = 7822$$

$$\text{And for 1920 cubic feet of piles we have } 1920 \times 4 \times \cdot 25 = 1920$$

$$\text{Giving a total weight on base in tons of} = 6341$$



Then we have for weight on base  $193.5^2 \times .7854 = 171.5^2 \times .7854 = 6306$  tons, or  $\frac{6341}{6306} = 1.005$  tons per square foot; or again, in favour of my plans  $(2.059 : 1.054 :: 100) = 46.4$  per cent.

In the above calculation, it will be observed that I have only taken the depth of sides for the supporting power from the bottom of the peat downwards, for from that point upwards the nature of the ground is such that the frictional resistance will be reduced to a minimum. Also, with respect to walls, the backs being made up with artificial ground, no supporting power from the sides will ensue.

We will now compare the costs for each plan.

The following are the quantities and prices in detail for my plan:—

1364 tons of tank plates, at £4 12s. 6d. per ton . . .	£6308 0 0
43 tons of 1-inch bolts, nuts, and washers for tank plates, at £20 per ton . . .	860 0 0
5½ cwt. of 1½-inch bolts, nuts, and washers, for column sole plates, at 20s. per cwt. . . . .	5 4 6
1½ cwt. of ¾-inch bolts, nuts, and washers, for fastening timber to top flange for building brickwork upon, at 20s. per cwt. . . . .	1 5 0
1½ cwt. of 1½-inch bolts and nuts, for bolting bearing beams to plates, at 18s. per cwt. . . . .	1 2 4
4 cwt. of ½-inch plate washers for ditto, at 8s. per cwt. . . . .	1 12 0
¾ cwt. of bolts, nuts, and washers, for blank flanges, for sand-pipe holes, at 21s. per cwt. . . . .	15 9
2400 holes drilled at machine, 1 inch by 1 inch, suitable for the 1-inch taps . . . . .	12 0 0
2400 holes, tapped one inch by hand, at 2½d. per hole . . . . .	25 0 0
1377.5 tons, at 8d. per ton, carriage dues (delivered) . . . . .	45 18 0
3532 plates, erected, bolted, and stemmed complete . . . . .	318 3 0
8045 cubic yards of old wall and ground excavated, at 1s. 7d. per cubic yard . . . . .	636 18 0
2316 cubic feet of piling and bearing beams complete, at 8s. per cubic foot . . . . .	347 8 0
1724 cubic yards of concrete, formed by crushing the old work and remixing it with one-seventh part Portland cement, at 6s. per cubic yard . . . . .	517 4 0
3850 cubic yards of tempered clay from Linthorpe, and worked complete, at 2s. per cubic yard . . . . .	385 0 0
855 cubic yards of cement concrete for tank bottom, at 6s. per cubic yard . . . . .	256 10 0
45 cubic yards of brickwork round internal diameter of tank, laid in one part Portland cement and one part sand, at 18s. per cubic yard . . . . .	40 10 0
2566 superficial yards of brick on edge paving, in one part Portland cement and one part sand, at 4s. per superficial yard . . . . .	513 4 0
537 feet by 9 inch by 3 inch timber curbing round internal diameter of tank, to build upon, fixed complete . . . . .	9 0 0
135 bushels of iron cement, at 1s. 6d. per bushel . . . . .	10 2 0
Total . . . . .	£10,295 5 7
Add 5 per cent. for profit . . . . .	514 15 4
Contractor's extra plant—	
5½ tons of temporary brackets, at £4 12s. 6d. per ton . . . . .	£25 8 6
3½ tons of water shafts, at £15 per ton . . . . .	52 10 0
2 air-lock doors and connections . . . . .	15 0 0
2 supply-pipe doors and connections . . . . .	15 0 0
Total . . . . .	£107 18 6 at 25 p. c.
Final total . . . . .	£10,836 10 6

And which gives according to capacity—

Chatto's—	
$183^2 \times .7854 \times 36 = 946,881$ c. ft., and $\frac{£10,836 \text{ 10s. 6d.}}{946,881} = 2.7452$ d. per c. ft.	
Cail's—	
$150^2 \times .7854 \times 32 = 565,486$ cub. ft., and $\frac{£6900}{565,486} = 2.7984$ d. per cub. ft.	
Livesey's—	
$165^2 \times .7854 \times 30 = 641,475$ cub. ft., and $\frac{£7000}{641,475} = 2.6188$ d. per cub. ft.	
Johnson's contract—	
$\frac{£6945}{641,475} = 2.5986$ d. per cubic foot.	

With reference to the air pressure required, I think 9 lbs. will not be exceeded. With regard to the health of the workmen under air pressure, it has been found that if the hours of labour are decreased in proportion to the pressure—that is, if a man can work 10 hours without detriment in an ordinary atmosphere of 15 lbs., he can work with the same result for 7½ hours in 1½ atmosphere, the time being divided into two portions as usual. Working in compressed air is not at all disagreeable, but may be said to act as a pleasant stimulant, causing that feeling which gives an inclination to laugh, although to remain too long at one time is ultimately exhausting.

In conclusion, I may state that I am indebted to the kindness of Mr. Dunning and Mr. Booth, for the reports of Messrs. Cail and Livesey, and also for the particulars of the strata.

#### PROPOSED EXTENSIONS AT THE INVERNESS GAS-WORKS.

It was mentioned in our issue for the 4th of December that the Police Commissioners of Inverness had requested Mr. Alexander Smith, manager of the Corporation Gas-Works, Aberdeen, to examine and report upon the state of the gas-works which have now been placed under their control, and the improvements which he would recommend to be made upon them. That gentleman has executed his commission, and his report shows that he has gone into the subject with great care and considerable detail. The following is a summary of it:—

Taken as a whole, Mr. Smith considers the plant to be in good working order. He finds that rich coal is used which not only gives between 1000 and 2000 cubic feet of gas more than coal of second quality, but also gives light of superior quality, a plan which he recommends, especially on account of the fact that the carriage is as much as 11s. per ton. The retorts are smaller than those commonly used in modern gas-works, but he is afraid that larger retorts could not be got into the ovens. He commends the plan of reducing the duration of the charges from six to four hours, which the present manager has adopted, and which economizes the carbonizing

of the coal and improves the quality of the gas, and he urges that a further reduction to three hours should be made.

As regards the storage power of the gasholders he is very decided in his opinion. Compared with the consumption in the depth of winter it is very small, the aggregate capacity of the two holders being only 60,000 cubic feet, whereas the greatest daily consumption is about 130,000 cubic feet; thus showing a deficiency of 70,000 cubic feet of holder power, which is a very disagreeable position to be in, as the gas cannot be made either satisfactorily or economically when the storage power is so much under the consumption. Great forcing is required at one period of the night in order to prevent the gasholders from grounding and the lights of the town going out, while during a portion of the day the retorts are lying idle for want of room to store the gas. There is thus severe wear and tear, and fuel and wages must be expended whether gas be made or not.

To meet these difficulties, Mr. Smith recommends the erection of a gasholder of 100,000 cubic feet capacity, thereby increasing the storage capacity to about 160,000 feet, or about 30,000 feet in excess of the largest daily consumption at present. The proposed gasholder would be 80 feet in diameter by 20 feet deep, and constructed so that it might be telescoped at any future time, when larger storage may be required. After indicating ground that should be acquired for the site of the proposed gasholder, and for the future extensions of the retort-house, stores, &c., Mr. Smith goes on to speak of the gas-mains, showing how very small mains are disadvantageous, and recommending that a district governor be got for the purpose of reducing the pressure in the higher levels of the town. He urges the desirability of having all the small and defective pipes replaced by larger ones, so as to reduce the very large percentage of unaccounted-for gas. The bulk of the service-pipes are only half an inch in diameter, a size which should not be laid, he says, under any circumstances. He observed that the public lamp fittings were very defective, and, on inquiry, he found that the work was not done under the superintendence of the gas manager, and he recommends that both it and the lighting should be under his charge.

On the question of meters he also makes some recommendations. The meters in use amongst the consumers are mostly of the wet kind, which he considers the best. But a great number of them are not stamped in accordance with the Sales of Gas Act, and he strongly advises that they be altered to meet the requirements of that Act, as they would then be a reliable measure between buyer and seller. He would have a number altered yearly, until the whole were gone over, and he recommends that wet meters should be taken out and tested at least once in every ten years, and dry meters once every three years.

In Mr. Smith's opinion it is in these things that the defects of the Inverness gas undertaking lie—namely, in main and service pipes, public lamps, and customers' meters; and it is only by close attention to these, he says, that the unaccounted-for gas, amounting to 29.94 per cent., can be reduced to any satisfactory extent; for, if the plant were in good order, the leakage, or unaccounted-for gas, should not exceed from 10 to 15 per cent.

After referring to the illuminating power of the gas, which he tested on two successive days, and found to be equal to at least 29 standard candles, or 9 candles above the requirements of the local Act, and equal to the highest quality supplied to any town, Mr. Smith proceeds to speak of the question of price:—"The present price of gas is 7s. 6d. per 1000 cubic feet. Many consumers appear to think that the price of gas should be the same in all towns. This idea, however, is quite erroneous. The difference in the carriage of coal, the quality of the gas supplied, the amount of capital employed, the quantity of gas sold per mile of main-pipe, and the nature and extent of the area supplied, must all be taken into account when drawing a comparison. After my inspection, I came to the conclusion that if the same judicious management be continued that I saw, a reduction in the price of gas will soon follow; but it is impossible to make gas of the same quality you are now supplying at a cheap rate, because rich cannel is always getting scarcer and advancing in price."

He concludes his interesting and valuable report by briefly indicating the extensions that he would propose to be taken in hand, and their cost. They are—gasholder, tank, and connections, of the estimated cost of £4800; and mains and connections, £400—or a total of £5200. The time required to complete the work should be about seven months. As it appears to Mr. Smith to be dangerous to delay with the gasholder, he urges that it be gone on with at once.

#### WATER GAS IN AMERICA.

##### REPORTS ON THE LOWE PROCESS OF GAS MANUFACTURE.

The *American Gaslight Journal* publishes two reports on this subject which we reprint. The first is a report addressed by Professors Rogers and Stephens to the Board of Trustees of the Philadelphia Gas Company, who have had the Lowe process in operation at their Manayunk Station; the second is in the form of a letter by Professor Morton of Stevens Institute of Technology, New Jersey, of his examination of samples of Lowe gas as manufactured at Harrisburgh. A detailed account of the Lowe process and of the apparatus employed was given in this JOURNAL, vol. xxvii., pp. 93, 94.

Philadelphia, May 11, 1877.

To the Trustees of the Philadelphia Gas-Works.

Gentlemen,—In accordance with a request made by chief engineer Mr. T. R. Brown, that we should examine the Lowe process for the manufacture of illuminating gas, as conducted in the works constructed by that company on the premises of the Manayunk Gas-Works, test its illuminating power, and determine its chemical composition and its quality to resist low degrees of temperature, and report upon the same; and also upon any points of incidental importance that might present themselves during the investigation, with a view to the availability of said gas for city lighting purposes, either when used alone, or when mixed with the ordinary city gas, as at present manufactured from coal, we beg leave to submit the following report.

The investigation which was submitted to us began Dec. 27, 1876, and in its several directions has been pursued, with many interruptions, owing to engrossing professional engagements, up to a recent date.

A great number of experiments have been made of a preliminary and comparative kind, having reference to methods of gas analyses, &c. It has been thought by us best to omit reference to such, and to confine this communication, for the most part, to a report upon the facts bearing directly upon the question with the gas trust, as to the availability of the Lowe gas as a substitute, in part or entirely, for the ordinary illuminating gas from coal.

The photometrical testing of the Lowe gas, as manufactured in their works at Manayunk, was conducted under four different modes of collecting it.

In the first instance, it was examined in the photometric-room of the works, being drawn directly from the large gasholder on the premises, and passed through the small meter to the standard burner.

In the second instance, owing to the large gasholder having been made the recipient of both the ordinary gas and the Lowe gas, and it not being the object to examine a mixture of such, it was collected in two large



india-rubber bags, of five cubic feet each, from the outlet of the meter of the Lowe works, and conveyed to the laboratory of Professor Rogers at the University of Pennsylvania, and from these bags transferred to a gasometer over water.

In the third instance, it was collected in two india-rubber bags, similar to those just mentioned, by tapping the pipe leading from the purifiers to the large meter. These were taken to the establishment of Mr. W. W. Goodwin, and there the gas was transferred to a gasometer and experimented on.

In the fourth instance, a large tin gasholder, of 20 cubic feet capacity, was sent to the works at Manayunk. It was there filled with water, and connected with the tube which was tapped into the pipe between the purifiers and meter of the works; the water was then allowed to flow out and the gas to flow in. The opening of this holder was then soldered tight, and the vessel conveyed to Mr. Goodwin's establishment.

For experimenting on the gas, portions were successively transferred to a small gasometer.

The production of gas from each charge varies between 4000 and 6000 cubic feet, and each operation at "running," during which the gas is made, lasts 30 minutes. Dividing off the 30 minutes into periods of five minutes each, it is found that the quantity of gas produced is far greater during the earlier periods than the later ones; and that, on the other hand, the gas which comes over during the later intervals, is much richer in illuminating materials than that which comes over during the earlier stages.

It was, therefore, a nice problem to so adjust the collection, either in the bags or the larger vessel sent to the Manayunk works, as to secure a mixture that would represent accurately the average of its quality. However, it is believed that, with the precautions taken, no serious error has arisen from that source.

*Yield of Gas as observed by the Meter, for Periods of Five Minutes each, up to the Close of the Run, which, in every case, was of 30 Minutes Duration.*

First Run.		
First five minutes	1600 cubic feet.	
Second "	1200 "	
Third "	800 "	
Fourth "	600 "	
Fifth "	550 "	
Sixth "	450 "	
Total yield	5200 "	
Second Run.		
First five minutes	1100 cubic feet.	
Second "	1600 "	
Third "	1050 "	
Fourth "	750 "	
Fifth "	650 "	
Sixth "	450 "	
Total yield	5600 "	

Consumption of anthracite coal, first run	248 lbs.
Consumption of crude petroleum, "	16 gals.
Consumption of crude petroleum, second run.	17 gals.

The following are the results of photometric examinations of the Lowe gas, as taken by the different modes above alluded to:—

*Examination at Manayunk.*

Gas drawn directly from gasholder, average of five one-minute observations. . . . . 12.51 candles.  
To obtain 16-candle light it was necessary to burn  $7\frac{1}{2}$  cubic feet.

*Examination at Laboratory of Dr. R. E. Rogers.*

Gas taken from Manayunk works, through large meter and transferred to small gasometer from bags, average of ten one-minute observations, normal temperature . . . . . 13.95 candles.  
Average of five observations, through coil, at 0° . . . . . 12.16 "  
Pressure . . . . . '85 inch.

*Examination at the Establishment of W. W. Goodwin Esq.*

Gas taken from pipe tapped between the purifiers and the large meter, and transferred to small gasometer from bags at Mr. Goodwin's, average of ten one-minute observations . . . . . 14.45 candles.

Candle burning 120 grains, 15-hole Argand burner, 7 inch chimney.  
Pressure . . . . . '85 inch.

*Examination at Establishment of W. W. Goodwin, Esq., on the day after preceding Experiments.*

Gas in large vessel filled from pipe tapped between purifiers and large meter at Manayunk Lowe gas-works, average of twenty-one one-minute observations . . . . . 15.00 candles.

On freezing same at temperature 0°, average of five one-minute observations . . . . . 10.30 "

General average of all the observations . . . . . 13.48 "

With a view to test the effect of burning the Lowe gas with different burners, the following trials were made, with the results appended:—

At the time of the experiment the City gas gave, with a 15-hole Sugg 16-candle burner . . . . . 17.75 candles.

The Lowe gas gave with a

16-candle, or 15-hole burner, an average of . . . . . 12.00 "

16-candle, or 24-hole burner, an average of . . . . . 12.5 "

14-candle, or 21-hole burner, an average of . . . . . 10.5 "

19-candle, or 27-hole burner, an average of . . . . . 9.00 "

Pressure at meter . . . . . '8 inch.

A Sugg bats-wing, burning 5 cubic feet per hour and pressure  $1\frac{1}{2}$  inch, equal . . . . . 3.5 candles.

It thus would appear that for the Lowe gas the 16-candle burner is the best.

From the above results, it would appear that the Lowe gas, manufactured at Manayunk, and supplied to us in the manner described, is inferior in illuminating power to that of the City gas as at present made from bituminous coal.

It should, however, be here stated, that since the Lowe gas owes its illuminating value (all other things being equal) to the amount of hydrocarbons derived from crude petroleum, it is in the power of the manufacturer to control, within a wide range, its quality by the use of a larger or smaller quantity of the oil.

The problem, therefore, of the ability of the Lowe gas to compete with, or replace, the ordinary coal gas resolves itself into the question, whether the cost of petroleum may be such as to admit of its being used in such large quantities as to produce a gas so highly charged with hydrocarbons as to possess an illuminating power much beyond that found by us in the present instance.

Wishing to confine ourselves purely to the facts which have come within our observation—we will not undertake to say what may or may

not be accomplished by any future experiments or improvements upon the present mode of manipulation or manufacture of the Lowe gas.

*Composition of the Lowe Gas.*

Without entering upon the question whether this gas is of the variety known as "water gas," modified by a chemical reaction between such and the petroleum vapour, the settlement of which would require an investigation not within the scope of our instruction, we here append the averages of several very carefully constructed analyses, and a comparison of the same with the city gas made from coal.

*Analysis of the Manayunk Gas, showing wide Variations in Composition. Lowe Gas brought from Gasholder at Manayunk.*

Hydrogen	42.86
Marsh gas	44.28
Olefiant gas	5.18
Carbonic oxide	3.43
Carbonic acid	.69
Sulphuretted hydrogen	.80
Oxygen	.14
Nitrogen (estimated)	.56
Ammonia, &c.	2.06
Total	100.00

*Lowe Gas taken from Pipe tapped between Purifier and Large Meter.*

Hydrogen	64.66
Marsh gas	24.73
Olefiant gas	4.81
Carbonic oxide	2.72
Carbonic acid	.19
Sulphuretted hydrogen	.80
Oxygen	.41
Nitrogen (estimated)	1.31
Ammonia, &c. (estimated)	.37
Total	100.00

*Analysis of City Gas for Comparison.*

Hydrogen	47.72
Marsh gas	38.53
Olefiant gas	5.20
Carbonic oxide	1.90
Carbonic acid	.94
Sulphuretted hydrogen	1.03
Oxygen	.17
Nitrogen (estimated)	.85
Ammonia, &c. (estimated)	3.66
Total	100.00

(Signed) R. E. ROGERS.  
LEMUEL STEPHENS.

*Stevens Institute of Technology, Hoboken, New Jersey, Oct. 31, 1877.*

Dear Sir,—The gas of which I now send you the analysis was collected by my assistant, Mr. W. E. Geyer, about ten o'clock in the morning of Oct. 20, at the Lochiel House, in Harrisburgh.

Connection was made from one of the gas-burners, by means of a short piece of rubber hose, to one after another of a number of glass tubes, of an inch in diameter, but drawn down to a very small size at either end.

After the gas had been allowed to flow freely for some minutes, the tubes were sealed by drawing out in the flame of a lamp, first at the outer end, and then next to the supply.

After these tubes had been filled, a quantity of the gas was allowed to bubble through a solution of acetate of lead, producing a considerable precipitate of lead sulphide.

Then the gas was allowed to flow through a glass tube immersed in a freezing mixture of ice and salt.

In this tube there was collected a considerable amount of volatile liquid, which proved, on examination, to be essentially benzine.

The tubes of gas, and the other materials, were then brought to my laboratory, in this place, where duplicate analyses were made of the gas, with the following results:—

	First. Analysis.	Second. Analysis.	Average. Analysis.
Carbonic acid	4.27	3.83	4.05
Olefines	13.89	14.34	14.12
Carbonic oxide	27.40	26.25	26.82
Marsh gas	22.54	23.70	23.12
Hydrogen	30.64	31.31	30.97
Nitrogen	1.09	.49	.79
	99.83	99.92	99.87

Regarding the determination of the carbonic oxide as of special importance, I then made a third determination, in which, after removing the carbonic acid and olefines as before, I determined the carbonic oxide by absorbing it with chloride of copper, in place of exploding it as in the more usual method; this method gave for the percentage of carbonic oxide 26.54, which is evidently a very satisfactory agreement with the other determinations.

Looking at the character of this gas, as shown by its composition, we are struck, in the first place, by the very large proportion of carbonic oxide which is present, and which is a very objectionable constituent, as it is one of the most virulent and dangerous of gas poisons, and as a consequence renders the accidental escape or leakage of such a gas liable to become the cause of fatal results.

All the standard writers on chemistry agree in stating that the presence of even a few per cent. of this gas in the air of a room renders it utterly unfit for breathing, and often even fatal.

It is even stated, on good authority, that the use of gas containing carbonic oxide has been interdicted by the Parisian Government as injurious to health, and that a commission, composed of the most prominent French chemists, reported to the same effect. (See the London JOURNAL OF GAS LIGHTING, Feb. 19 and June 10, 1856.)

Again, even when the gas is burned, and the carbonic oxide converted into the less dangerous carbonic acid, we still have a serious difficulty, for this gas also is of an objectionable character, and any addition to the amount produced by ordinary gas is to be deprecated; but the above analysis shows that this Harrisburgh gas will yield, in burning, about 70 per cent. more carbonic acid than an ordinary coal gas, and will, therefore, tend to vitiate the air of the rooms in which it is burned 70 per cent. more than the same amount of ordinary coal gas.

Though the amount of sulphuretted hydrogen, in the gas examined, was not determined, being only a small fraction of a per cent., yet the very marked properties of that gas render even this small amount very manifest, and liable to cause serious inconvenience.

A piece of paper containing acetate of lead, and perfectly dry, held over a jet of this gas was instantly blackened, and its ill effects on lead paint or



paper containing, or coated with, white lead can, therefore, be easily surmised.

After combustion, the sulphur of this sulphuretted hydrogen would finally reach the condition of sulphurous and sulphuric acids, whose destructive and corrosive effects are familiar to all.

In reply to your question whether a "water gas" can be made which shall not contain an excessive amount of carbonic oxide, I reply that no practicable method is known. By working with very hot fires, nearly all the oxygen of the water might be converted into carbonic acid; but, unless this was removed by an immense expenditure of lime in purifiers, it would render the gas useless for illuminating purposes, and, if removed, the yield of gas would be very small, and its production very expensive.

(Signed) HENRY MORTON.

The *Polytechnic Review* publishes the following criticism upon the report of Professors R. E. Rogers and Lemuel Stevens to the Trustees of the Philadelphia Gas-Works upon the Lowe process at Manayunk, by Mr. G. S. Dwight, of Springfield, Mass. :—

The investigation of new methods for the generation of illuminating gases not only opens a wide and attractive field for the expert, full as it is of subtle questions in chemical analysis, but the subject is one of great popular interest. Our American communities have, within the last few years, reached the conviction that the cost of gaslight is unreasonably high, and now occupy a position of antagonism toward the companies, such as led some time ago in England and continental Europe, to stringent governmental interference between manufacturer and consumer. Hence the trial of the Lowe process upon an increased scale of practical operations, at Philadelphia, was watched with much interest, because its uniform success, on an ascending scale, at various other places has given promise of usefulness.

It was therefore with regret, not to say surprise, that after long delays it was rumoured that the experts of the Gas Trust had reported adversely upon it. As a very spirited controversy is at present in progress in that city between the City Council, the Gas Trustees, and the Press, as to the fairness of the trial accorded to the new system, a discussion to which many other communities are listening, a presentation of some facts connected with the examination by Dr. Rogers and Professor Stevens, and an analysis of their report may be opportune.

It should be stated that the works at Manayunk were erected without any cost to the Philadelphia Gas Company, by private parties, upon the following terms :—

The contractor was to have control of the holder used for that district, and was privileged to make 200,000 cubic feet per day, at a specified price, provided so large a quantity was required for local distribution. On a fulfilment of the contract the cost of the works was to be paid by the trust, which was thereafter to have licence for use of the process on payment of a stipulated royalty. These facts are mentioned as interesting evidence, that the onus of the trial lay on the contractor. It was provided that the gas delivered into the holder should possess standard illuminating power—viz., 16 candles; that it should not exceed 600 density, and its cost in holder should be within a prescribed price, and that it should be no more liable to condensation than coal gas.

These four points were left to the determination of Dr. R. E. Rogers, of Pennsylvania University, and Professor Lemuel Stevens, of Girard College, who upon the 11th of May last rendered this report. It is published in connection with this paper, and reference thereto is asked in the review which it is designed to make herein of the circumstances attending the investigation and the methods employed.

The circumstances at the time of the examination were peculiarly unfavourable, and rendered it almost impossible to obtain accurate or trustworthy results.

The new method which, up to this period, had been making the entire supply for that district, was suddenly restricted to a small proportion, the remainder being derived from the coal benches. The gas in the holder was, in consequence, a mixed one, which it was not desired to study, and the experts were therefore compelled to depend for their investigation upon samples, drawn back of the holder, at the meter inlet. This expedient is an exceedingly doubtful one in any gas system, but is precarious in the extreme in the Lowe process, which, in an increased degree, depends on the law of diffusion in the holder for an equalization of the gases, which in their generation are inconstant, both in volume and quality. For this disadvantage the examiners were, of course, in no way responsible. They admit it embarrassed their labours; but they express the belief "that, with the precautions taken, no serious error has arisen from that source." From this belief, however, the writer most respectfully but emphatically dissents, and not on theoretic grounds merely, but because the results and deductions of these gentlemen vary so widely from those reported by other experts, equally eminent, whose investigations at Manayunk and elsewhere were conducted under more favourable circumstances as to point to this fact as a source of error. If the Philadelphia trustees were sincerely desirous of settling strictly upon its merits a question of great public importance, a period somewhat earlier or later might have been selected for its determination, when the process was operating independently, and this grave disadvantage would thus have been avoided.

Another objection is raised against the treatment of the samples thus obtained. The taking of illuminating gas for test by water displacement, and in rubber bags, is not now practised where accuracy is demanded, because of more or less action on the sensitive hydrocarbons, &c. Nor is the conveyance in mid-winter over long distances, repeated transfers by means of water, and a suspension over the same for weeks, calculated to improve the luminosity of gas. Regarding the tests themselves, as reported by Messrs. Rogers and Stevens, exception is taken to the manner in which they were many of them made, and especially to the form in which they are presented in the report, since by reason principally of the omission of data, it is not possible for their professional brethren to check their calculations and determine their correctness; hence the exact value of the examination is left undecided.

The question of condensability, which is of great importance, since upon the permanency of a gas depends the ability of the manufacturer to give the distant consumer a satisfactory quality of light, besides saving the cost which loss in transit necessarily involves, is not commented upon. This is the stranger, since very interesting tests were made with remarkable results, as follows :—A coil of 50 feet of half-inch lead pipe was packed in a cask of ice, snow, and salt, until a temperature of zero was obtained, into which the Lowe gas was admitted and held for 60 minutes. Photometric observations, before and after this test, showed a loss of illuminating value of less than one-half of a candle, and no deposit in the coil. For comparison, the city gas made from coal was similarly exposed, and ceased to burn in three minutes, leaving considerable residuum in the pipe.

The density of the gas is another matter, not only of practical moment, but so indispensable in a determination of other questions under investigation, and for a verification of analysis, that the silence of the report on this point creates surprise.

The illuminating power of the Lowe gas seems to have been selected

as the determining point of the whole investigation, and since its alleged insufficiency constitutes the sole and only objection raised against it by Messrs. Rogers and Stevens (and this is an objection never before raised), it will be pertinent to review with special care their treatment of this part of the examination. On the occasion of their first visit to Manayunk, it appears that the holder was in the control of the Lowe process, and at first is mentioned as having been made on the spot, which gave the value at 12.51 candles only. This is the only test free from the objections heretofore mentioned, but the report does not state in what kind of a burner the gas was used, and the entire experiment involved only five one-minute observations, so that its value is very questionable. It should here be remarked that as the principle of the determination of illuminating values is based upon the relative light given out by the consumption of 120 grains of spermaceti in comparison with 5 cubic feet of gas during the same time, usually one hour, so it is extremely unsatisfactory to rely upon a few one-minute tests, because, while the consumption of the gas is constant, that of the candle is variable, showing a difference frequently of several points in as many minutes. Moreover, the density of a gas is in this connection entitled to consideration in the adaptation of the burner to its peculiarity in this respect. Certainly no just comparison lies between the illuminating power of the coal and Lowe gases, in the manner proposed by the experts of the gas trust. They assert that, "at the time of the experiment, the city gas gave with a 15-hole Sugg 16-candle burner, 17.75 candles;" and then give the average aggregate result of 56 one-minute tests, variety of burner not stated, at 13.48 candles, and in this average is included ten observations at zero. In other words, these gentlemen would have one single test of Philadelphia gas, under the most favourable circumstances, decisive as against the average of a number of observations of the Lowe gas, many of which were made under peculiarly unfavourable conditions. It would have been an easy step to still further reduce the average value of the latter by introducing a test with the Bunsen burner. In enumerating trials of different burners, they report that a 19-candle 27-hole burner gave only 9 candles, and yet this identical burner yields to other reputable experts at Manayunk 19.81, and at Lancaster 20.30, for the Lowe gas. Such glaring discrepancies as these justify the inquiry whether, in the investigation of Messrs. Rogers and Stevens, any copper instruments or coils were used. The absorbing power of this metal on the luminous hydrocarbons is so well understood now, that it would not be employed when accurate determinations were desired.

On the basis of these observations, open, as has been seen, to very serious objections, the experts conclude "that the Lowe gas, manufactured at Manayunk, and supplied to us in the manner described (the italics are used by the writer), is inferior in illuminating power to that of the city gas as at present made from bituminous coal."

Then follows an acknowledgment which is a full concession of the whole matter—viz., "It should, however, be stated here that since the Lowe gas owes its illuminating value, all things being equal, to the amount of hydrocarbons it contains, derived from crude petroleum, it is in the power of the manufacturer to control, within a wide range, its quality, by the use of a larger or smaller quantity of the oil." (Italics as before.) This admission virtually concedes the point at issue, the illuminating power having been the only ground of their objection to the system.

The question raised relative to the supply of petroleum has been pretty well settled by events later than the report; but it may be interesting to state that coal-oil, which can be put into the market at a competing price with petroleum, is at least equally desirable for enrichment, and presents a safe alternative to the manufacturer.

*Composition.*—The analyses as the averages of repeated tests are, if correct, very interesting, and especially so as developing a feature entirely novel in the manufacture of gases into which water products enter. Reference is made to the unexpectedly small per centage of carbonic oxide shown in the tables. So large a disappearance of oxygen is phenomenal, and opens some very interesting chemical questions not pertinent here. It is to be regretted again that the density of the gas analyzed is not given, that the accuracy of the figures presented might be tested by computation. But, for the purposes of this review, the analyses are valuable to this extent—that they confirm the doubt already cast upon the photometrical observations. A comparison of the composition of the "Lowe gas taken from the pipe tapped between the purifiers and the large meter," and which was the gas tested for candle power, with that of the city gas, leads to the conclusion that the former would burn with a higher illuminating value than the latter. Its per centage of olefiant gas is very nearly identical, with a strong probability of a larger proportion therein of acetylene, one of the most luminous hydrocarbons, while the marked increase of hydrogen in the Lowe gas should secure higher flame temperature, and a consequent increase of luminosity. In addition to this, the large decrease below the Philadelphia gas of those impurities which are known to reduce the candle power of gases is quite noticeable. The presence of the proportion of nitrogen and oxygen mentioned, it is believed, might be charged to the entrance of atmospheric air into the sample during the transfer.

*Cost.*—On this very practical point the experts express no opinion, but merely give, without comment, the quantities of coal and oil used, during the time of their investigation.

These, however, confirm the claim heretofore made, that 50 lbs. of anthracite and three gallons of crude petroleum are sufficient for the production of 1000 cubic feet of illuminating gas, and strengthens the opinion that the Lowe process is capable, by its reduced cost of production, of competing with the manufacture of coal gas.

In conclusion, it is impossible to escape the conviction that for the purposes of determining so important a public matter as the possible supply of a good quality of illuminating gas, at a reduced price to the consumer, the report of Messrs. Rogers and Stevens is not competent, and this conclusion is reached solely by an analysis of the report itself, independent of examinations by other professional gentlemen, which may be presented hereafter.

Geo. S. DWIGHT.

#### AMALGAMATION OF THE MELBOURNE GAS COMPANIES.

In the *JOURNAL* of the 13th of November last we gave an abstract, from the *Melbourne Argus*, of the scheme for the amalgamation of the City of Melbourne Gas and Coke Company, the South Melbourne Gas Company, and the Collingwood, Fitzroy, and District Gas and Coke Company. The amalgamation was to take effect from the present day, contingent upon the Companies obtaining an Act of Parliament, sanctioning the same. That Act has been obtained, and consequently the several undertakings are now merged in one, under the title of "The Metropolitan Gas Company."

We learn from a recent number of the *Melbourne Argus* that the Bill promoted by the Companies underwent several changes during its passage through the Legislature. The Bill, as originally presented, provided for the payment of maximum dividends of 12½ per cent., for the offer of new shares to existing shareholders at par, and for the creation of a large reserve-fund. The standard of illuminating power was 14 candles, and



maximum price of gas 7s. 6d. per 1000 cubic feet. There was no provision for inspection of accounts.

As amended in the Select Committee of the Assembly, a sliding scale of price and dividend has been incorporated in the Act. Taking the standard price of gas at 7s. 6d. for the first five years and 7s. afterwards, and taking the initial dividend at £10 per cent., it is provided that the Company shall not pay any higher rate without reducing the price of gas in a given ratio, and that all surplus profits shall be divided in equal proportions between the shareholders and the consumers of gas. New shares are to be put up to public auction or tender, no dividend being payable upon the premiums received thereby. Lastly, an official auditor is to be appointed, with power not only to test the accuracy of the accounts of the Company, but to see that all the items are properly charged to capital or to revenue, as the case may be. The reserve-fund has also been limited in amount, and the standard of illuminating power has been raised from 14 to 15 candles.

Power is given by the Act "to any Metropolitan Board of Works which may hereafter be constituted, to purchase the undertaking and property of the United Company," and the terms of purchase are to be based upon a calculation of eighteen years profits of the Company. The Select Committee inserted a clause in the Bill limiting the sphere of the Company's operations to a radius of eight miles of the Post Office, instead of granting the twenty miles asked for by the promoters. There is no provision for the periodical publication of accounts.

## IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

During the week just ended the amount of business transacted has been practically nothing, seeing that all the large iron and steel works have been entirely closed, and most of them still remain so. The interval is, as usual, being utilized for stock-taking, and for effecting necessary repairs to or alterations of machinery and plant. At several large concerns new engines are being put down for rolling-mill and general purposes, and at the Bessemer establishments there is a general movement for much more powerful machinery, and the adoption of still greater economy in the production. The other leading markets of the country having also been closed or purely inanimate, it will not be necessary to do more than mention the fact that all brands of pig iron have been absolutely neglected, and altogether nominal in price all round. The same is the case in respect of finished and merchant iron.

The collieries have for the most part been closed all the Christmas week, but at a few of the larger pits a re-start was made on Thursday morning, the existing demand for house coal being now strong, owing to the seasonably severe weather. At the same time the market is much within the capacities of the means of supply. Coke is neglected.

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is no material change to notice in the condition of trade since last week, the holidays still, to a large extent, interfering with business. Many of the pits and iron works were closed during a great part of last week, and in the majority of cases there will be nothing doing during the whole of the present week.

The better classes of round coal for house fire purposes are still almost the only description of fuel that meet with anything like a good inquiry, and the present severe weather will no doubt stir up the demand for this class of coal, which has been unusually dull for the time of the year. Other classes of fuel continue a drug, and the holidays at the mills and iron-works have temporarily put a stop to the local demand for forge coal and engine fuel. There is a good deal of pushing for orders amongst merchants and dealers, and for sales in bulk prices are very irregular, but with the exception of a slightly weaker tone in common coal for steam purposes, the current market quotations are without change. Best screened Wigan Arley, for house fire purposes, is quoted at the pit mouth at 10s. to 11s. per ton; common ditto, 8s. to 9s.; Pemberton four-feet, 8s. to 8s. 6d.; common Wigan mines, for house fire purposes, 6s. 6d. to 7s.; common coal for steam and forge purposes, 5s. 6d. to 6s. 6d.; burgy, 4s. 6d. to 5s. 6d.; and ordinary slack, 2s. 6d. to 4s. per ton, according to quality.

The shipping trade is still extremely dull, and those collieries that are mainly dependent upon this class of business to clear off their supplies are very badly off for orders, while there is so much competition in the market that exceedingly low prices have to be taken.

There has been little or nothing doing in the iron trade during the past week, and prices nominally are without change; the quotations for delivery into the Manchester district ranging about as under:—Lancashire pig iron, No. 3 foundry, 51s.; No. 4 forge, 50s. per ton, less 2½ per cent.; Derbyshire, No. 3 foundry, 50s. 6d.; No. 4 forge, 49s. 6d., less 2½; Middlesbrough, No. 3 foundry, 48s. 9d.; No. 4 foundry, 47s. 9d.; No. 4 forge, 47s. 3d., net cash. Lancashire and Middlesbrough bars, £6 5s. to £6 7s. 6d.; Staffordshire, £6 7s. 6d. to £6 10s. per ton.

The Lancashire finished iron makers, owing to the low prices now ruling in the market, have determined to make a reduction of 5 per cent. in wages, and, considering the present depressed state of trade, no serious opposition on the part of the men is expected.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

Last week, being Christmas, there was a large amount of broken time at the Durham collieries, and, of course, a lessened production for the time. The pits, however, are working as steadily as they usually do at this season of the year, and are getting a fair share of trade. There are not many reports of extensive contracts having been made yet in gas coals for next year; and, from the uncertainty which surrounds everything connected with the coal trade, and in view of a slight tendency to lower rates, it is not probable that the Gas Companies will enter upon large transactions in advance, except at very moderate rates. The present official quotation is about 8s. best, and 7s. for medium qualities of gas coals; but for immediate business many collieries seem to take a lower quotation than this for cargoes. Second-class gas are about 6s. 6d. No doubt, after the holidays are closed, the gas coal trade will open out very steadily, and the pits will work up to full time. There is every probability that the lock-out of miners in the Northumberland steam coal trade will continue over January, at least, and that the tendency of it will be to improve the value of second-class Durham coals. Winter having set in suddenly in the North, the price of house coals tends upwards a little.

The coasting trade is particularly dull this Christmas. Whatever little business is put into the market is snapped up greedily even at the low quotations current. Severe frost is reported from the Baltic, which will stop all shipments thence. The last coasting quotations were as follows:—London, steamer, 4s. 3d.; Dublin, 6s. 6d.; Havre, 6s.; Rouen, 7s.—all for gas coals. Sailing ships are getting about 6s. 3d. per ton to discharge gas coals at the wharves below bridge. No great amount of steam coal is

being shipped from the Tyne. There is every appearance that freights will greatly favour shippers over the month of January.

There was little work astir last week in the factories or building yards, holiday being very general. Trade prospects are not very cheering at present, and there is much destitution amongst the working classes, and an absolute dearth of fuel at the dwellings of many of the Northumberland miners. The chemical market is very dull.

## TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The movement to which I referred last week as being in progress at North Berwick for the acquisition of the gas supply undertaking by the Town Council has suddenly and unexpectedly collapsed. It was formally resolved by the Town Council that the Burghs (Scotland) Gas Supply Act should be adopted. An opposition, however, arose amongst the ratepayers, and the question of adopting the Act was eventually put to the test of a plebiscite of the householders, with the result of a majority declaring in favour of the action taken by the Municipal Authorities. But within the past few days the Town Council have resolved to abandon the measure in the meantime, in consequence of the keen opposition which was given to it by a large section of the ratepayers. One of my correspondents says that the opposition is much to be regretted, as in his opinion, as also in that of the most respectable portion of the community, the adoption of the Act would have been a great benefit to the town.

Opposition has likewise arisen against the adoption of the Gas Act at Elgin. A remonstrance, signed by upwards of forty of the ratepayers, was presented to the Town Clerk a few days ago, in which it was submitted the existing and eventual circumstances connected with the transfer of the gas-works are such that it would be in no way favourable to the ratepayers or consumers of gas generally. Provost Culbard, by advertisement, at once invited those persons who signed the remonstrance to meet with him for the purpose of having a conference on the reasons which had induced them to take action on the subject. No report of the proceedings at the conference has yet come to hand, but it is not improbable that a poll will now be taken to decide the question.

There is room to fear that some confusion and difficulty will arise in connection with the proposal to adopt the Anstruther Gas Act in Airdrie, inasmuch as there is now being floated a new undertaking, designated the Airdrie Gas Consumers Company, Limited, whose "object is to supply gas to its members at the cheapest possible rate." It is also proposed by the new Company "to purchase the works of the Airdrie Gaslight Company, if the same can be got at a fair valuation." It is intended to raise a capital of £20,000, in shares of £1 each, only consumers being shareholders, no member being entitled to more than 50 shares, and each being entitled to five shares. Furthermore, it is stated that only 7 per cent. on the paid-up capital will be paid to the members, the balance of profit (if any) being employed in lowering the price of gas. A very curious clause crops up in the prospectus; it is as follows: "The object of the new Company is not to compete with the Airdrie Gaslight Company; but solely to put an end to the monopoly of supply of gas which they have too long held, and to transfer to the town the right of supplying themselves with the best gas at the lowest possible rate." The promoters of the new Company propose to transfer the profit to the town; but it would almost seem as if they desired the transference to be done at two stages, so that they might do a profitable stroke of business in the final one. However, as a simple chronicler of events, I must not allow myself to give free vent to my suspicions, but shall wait to see how the new movement meets with the approbation of the ratepayers, who are the ultimate court of appeal in such a matter.

In the beginning of December I mentioned that the Burghs (Scotland) Gas Supply Act had been adopted by the Town Council of Peterhead, and I now learn from that town that the time for lodging objections expired on Wednesday last, and that up to the time at which my correspondent wrote none had been lodged. The probability is, therefore, that the Town Council will resolve, at their first meeting, to negotiate with the Gas Company to take over their works and the gas supply undertaking generally.

During the last four weeks large numbers of new gas-lamps have been erected at Burntisland, and at Wellshothill, which is a sort of outlier of the village or burgh of Cambuslang, but in which street lighting has now for the first time been adopted.

Great dissatisfaction has for some time been expressed at the nature of the gas supply of Ballater, an important village near Balmoral; and it is said that while all the persons who have ever used gas there are unwilling to give it up, there can be no surprise if the treatment which they have lately received should cause a general adoption of oil-lamps.

The most important matter in connection with water supply undertakings during the last few days, was the formal inauguration of the Inverness Water-Works. The supply of water is from Loch Ashie, fully six miles distant from the town. The loch yields 70 gallons per head of population per day, or a million gallons daily. The entire scheme cost £81,000.

A very dull condition of things has prevailed in the Glasgow pig iron market during the past week, and prices have fallen lower and lower, business being done last Friday down to 51s. 6d. per ton cash, and 51s. 8½d. one month.

The coal market has not developed any new features during the past week. The demand for shipping sorts is exceptionally quiet for this time of the year, and at present no indications of improvement are experienced. In house coal a rather better business has been done, in anticipation of the New Year's holidays. All other kinds continue in poor demand, yet prices remain quatably unchanged.

**WIGAN CORPORATION GAS-WORKS.**—At a special meeting of the Wigan Town Council, on the 28th ult., it was resolved, on the recommendation of the Gas Visiting Committee, that the salary of Mr. Hawkins, the Gas Manager, should be increased from £300 to £400 per annum, as and from to-day.

**DRAINAGE AND WATER SUPPLY OF HAILSHAM.**—The Local Government Board have granted permission, on the inquiry of Mr. Harrison, C.E., to the Municipal Authorities of Hailsham to borrow £6000, for the purpose of constructing a system of drainage through the town—£4000 for proper drainage, and £2000 for pipes to be laid from Polegate to the Eastbourne Water-Works, and from Polegate to Hailsham, on the plan set out by Mr. G. A. Wallis, Engineer to the Board.

**SALES OF PROVINCIAL GAS AND WATER COMPANIES SHARES.**—On the 21st ult., twelve £25 shares in the Leicester Water-Works were sold at Nottingham by auction at £40 5s. a share, and one share at £39 7s. 6d. At the same sale, Nottingham Water-Works £50 early shares realized £79 and £80 7s. 6d.; £19 5s. ditto, £28 7s. 6d., £28 10s., £29 5s., and £29 7s. 6d.; Derby Water Shares, £12 10s. paid, £21 and £22 12s. 6d.; and Nottingham Corporation Gas Annuitants made £78, £78 2s. 6d., £78 5s., £78 7s. 6d. On the 24th ult., 270 new shares in the Dover Gaslight Company were sold by auction, realizing an average premium of 53½ per cent. The maximum parliamentary dividend on these shares is 7½ per cent.



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TO CORRESPONDENTS.

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THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 8, 1878.

Circular to Gas Companies.

THE City of London Gas Act, which first fixed an illuminating power of sixteen-candles for the gas supplied by the Chartered Gas Company, came into operation in September, 1868. Since that time the gas of the Company has been regularly tested, and the results published, and it must be an astonishing thing

to most people that so few failures to comply strictly with the Act have occurred. As a rule, the gas supplied from every station of the Company is, at least, one candle above the statutory minimum; at one station it is very frequently two candles over. All this, however, goes for nothing with the Metropolitan Board of Works, who have seized, we cannot say the first opportunity (because small defaults have occurred before) of proceeding to recover the forfeiture incurred. We see, almost with regret, that the Company condescended to make an appeal *ad misericordiam*. They might have been certain that it would prove of no avail, though backed by a few earnest friends; consequently, the necessary proceedings took place at the Police Court, and the Company paid the fine, their representative, we need hardly say, looking as pleasant as ever.

The case may not be without its influence on future legislation. When it can be proved, by evidence in the possession of the Metropolitan Board, that the Chartered Company, for more than fifty-one weeks out of the fifty-two in the year, supply gas of much superior quality to that they are required to furnish; when it is known how ignorant we are of the conditions under which gas of a certain quality can be produced, and when we reflect on the possible variations of the standard of comparison, we confess to astonishment that the Metropolitan Board should have pushed this case to extremities. One thing we dare to assert, and that is, that every one concerned in the management of the Chartered Gas Company is earnestly desirous of fulfilling the requirements of the Acts of Parliament, especially as regards illuminating power. This is a matter on which, happily, no difference of opinion exists. We have here no squabble over purifying processes. The Company use the best coals that come to hand; and if a day's default occurs, the public may be assured that the Managers are innocent of any attempt to defraud. It must not be for a moment supposed that the Company gain a fraction of a farthing by these occasional defaults. Gas-works are conducted on a rough-and-ready principle; the same things are done regularly day by day from year's end to year's end, and the expenses of the Company are exactly the same. In our opinion only systematic violations of the statutes will justify prosecutions; and we hope that, in future enactments, nothing less than the average of a week's testings will be held to justify proceedings for forfeitures. The testings may or may not be a farce; but we contend that they should not be made the means of extortion. It does not matter, however. As most sagaciously remarked at the Metropolitan Board, consumers pay the fines, and, as the police-fund is benefited, rate-payers are relieved. It is just one of the little juggles for which our complex Legislature provides, and perhaps no one is the worse for it.

We have repeatedly said that the present mode of testing the illuminating power of gas is a very unsatisfactory process; but we look, unfortunately, in vain for indications of improvement. We have no more belief in oil lamps than we have in candles. If Messrs. Sugg and Kirkham could bring to perfection the self-registering apparatus they devised some years ago, they would render all gas manufacturers an important service. Two sources of error of much consequence would be eliminated, and we should have what may be called Nature's own record of the value of the gas. Of course, we make no reflection on present Examiners; we shall throw no doubt on their competency or conscientiousness; still we should be glad to have some other mode of examination than that now employed. If the majority of the members of the Metropolitan Board of Works had taken fairly into consideration the doubts suggested by our present mode of examining gas, they would have hesitated before they entered upon the recent prosecution. They have, however, achieved a small triumph, and Vestrydom may be grateful. It will be something for the present members to look upon with pride, when, having a popularly-elected Board, they sink into oblivion.

Mr. Clemenshaw is still unable to obtain a settlement of his claim on the Dublin Corporation. No money is forthcoming from any source. Promises are made, but it is hardly surprising they are not fulfilled. The Chamber of Commerce promise, the Gas Company promise in a qualified way, and members of the Corporation talk of making a contribution; but it is all talk, and the cash is still wanting. But Gas Engineers are not the only sufferers by the defaults of the Corporation, who have recently incurred further heavy expenses in the promotion of an Improvement Bill, and have once again failed to discharge their liabilities to their professional advisers and others. As a matter of course, we have a special sympathy with the Irish newspaper proprietors who have not been paid for inserted advertisements connected with this abortive scheme; but they have an opportunity of taking their revenge on the Corporation, which Mr. Clemenshaw and his fellow-sufferers have not.



It is not only in London that complaints are made as to the deficiency of illuminating power. At Ipswich it is reported that a small deficiency is the normal condition of things; while on Sundays the Company furnish but a "dim religious light," considerably unlike that required by the Company's Act. There can be no difficulty in maintaining a fourteen-candle standard with great regularity, and we are rather surprised to learn that the quality of the gas so often falls below that standard. There is, of course, a question as to the instruments employed to test the accuracy of the gas. Practically, after long experience, we have never found any serious defects to arise from this cause. It might be, however, though very unlikely, that inaccurate registration would give rise to small errors, and it would therefore be well to have the test-meter verified at stated intervals. The Ipswich Gas Act, we believe, requires a six-hours notice of the intention to test, and therefore the Company are without excuse when the gas falls below the standard.

Complaints are also made at Preston and Burton-on-Trent, the undertaking in the former town being in the hands of a Company, and the latter in the hands of the Local Authority. At Preston the question seems to be mainly one of an excess of impurities, but there are also complaints of deficiency of illuminating power. The standard in the town is eighteen candles, and according to the reports of the Borough Surveyor the gas is commonly of richer quality, the deficiency of illuminating power being ascribed to naphthaline, which chokes the pipes. These complaints, of course, give rise to a talk about purchase; but, for the moment, the Corporation are not disposed to move in the matter. Civilities are evidently not wanting on the part of the Company, and probably if a little pains were taken to instruct consumers in the adoption and use of the best consuming apparatus, complaints might altogether cease. But at Burton-on-Trent it would appear that the demand for gas has outgrown the means of supply—that is to say, that the capacity of the existing mains is insufficient to furnish, at a proper pressure, the amount of gas required. This is a common source of complaint, and Gas Companies and Local Authorities alike should look to the matter.

Notwithstanding what we said last week, we notice that the Town Council of Hastings have resolved on appointing a Committee, with the view of ascertaining the steps necessary to be taken by the Local Authority for the purpose of supplying the town with gas. If they are desirous to obtain the undertaking of the Company, they may perhaps acquire it for a fair consideration. If they are indulging any dreams of being able to set up competing works, we may candidly assure them their dream will never prove a reality. The Gas Company have served Hastings well. The works are a model, and, as we said last week, taking all the conditions into consideration, the price of gas is most reasonable. Parliament never have allowed, and, we venture to predict, never will permit a ruinous competition, at the expense of the Ratepayers, with a Company who can fairly show that they have always done their duty.

The Corporation of Worcester have renewed their contract with the Gas Company at last year's prices, and, although some dissatisfaction exists, we may take it that the general feeling of the Town Council is in favour of the Company. If any alteration be desired—and we cannot say that any such general desire exists—we would recommend the Council to adopt the average meter system, and take the lighting, extinguishing, and cleaning into their own hands. Public lights are rarely profitable to Gas Companies, and we have little doubt that the Company at Worcester would be glad to be relieved of the responsibilities attached to the management of them.

The Corporation of Rochdale having to a certain extent starved their gas undertaking, found it insufficient to furnish the supply demanded. They then cast about for the means of extending it, and had fixed upon a site for the erection of new works. But they never acquired the land necessary for the purpose, and now they have been judiciously advised by Mr. T. Newbigging, that additions to their present works will tide them over several years. Looking at the prospects of northern boroughs, and the desirability of as far as possible limiting their indebtedness, we strongly advise the Corporation of Rochdale to add to their present works, and not incur the debt which the erection of new works would involve. The times are critical, and we could not recommend any cotton town to increase its liabilities.

**QUALITY OF THE BIRMINGHAM GAS.**—Mr. Thomas Jackson, the Corporation Gas Inspector, reports that during the month of December last, at the four gas stations of the Corporation, he made sixteen examinations of the gas supplied to the borough for its illuminating value. The maximum light in sperm candles was 18.14; minimum, 16.14; average, 17.33. The parliamentary standard is 15 candles, with Sugg's No. 1 "London" burner. During the year 1877, at the four gas stations, there were 208 examinations made of the gas. The maximum light was 19.67 sperm candles; minimum, 16.06; average, 17.29.

## Water and Sanitary Notes.

A JUDICIOUS hint, given by the Home Secretary to the Metropolitan Board of Works, makes it tolerably certain that the ensuing session of Parliament will not be allowed to pass without legislation, having in view to prevent the disastrous floods which every now and then occur in South London. The Board know well the nature of the only measure which Parliament will sanction, and they must frame their measure in accordance with the principles which Parliament may be said to have laid down. We have argued the question so often, that we need now only re-assert the opinion, that the whole of the metropolitan area should contribute to the cost of the works necessary to prevent the incursion of the tidal floods into the low-lying districts of Southwark, Lambeth, and Fulham. That the frequently-recurring inundations have not driven the poor inhabitants of those districts from their dwellings is simply owing to the fact that their necessities compel them to remain in these habitations. The immense amount of discomfort they have endured ought to have softened the heart of every distant Vestryman; but we fear that nothing short of the hint given by the Home Secretary would have induced the Metropolitan Board to perform an obvious duty.

There seems to be, as we have remarked before, a pretty general *consensus* of opinion among the Metropolitan Vestries, so far as concerns the purchase of the existing water undertakings; but by no means the same as to the advisability of starting a dual supply. Let what will be said, the inhabitants of the Metropolis are, on the whole, and with sufficient reason, satisfied with their present water supply. They grumble at the price charged for it, as they would if it were one-half of what it is, but they know that they never want water except through their own carelessness and neglect, and common experience shows them that the quality of the water, denounced as it is, does them no harm. Under such circumstances no enthusiasm can be expected to prevail in the Metropolis respecting the proposals of the Metropolitan Board. They are certain, we think, to fall dead, and if by accident they should reach a second reading and a hearing before Committee, they are certain to fail. The hour has not yet arrived for the purchase of the Metropolitan Water Companies; the new scheme is totally unnecessary. Further developments of London may presently require fresh supplies of water, and since it may be accepted that the present supplies of water are nearly exhausted, the fresh supply must come from new springs. Putting aside, as altogether out of the question the acquisition of a Cumberland Lake, we must look to the chalk basin around London as the source of our future supply. But the Companies can resort to this source as well as any Municipal Corporation, and with far greater economy. If the time should ever come when every inhabitant of London will require a supply of more than twenty-three gallons a day, the Companies can give them the extra supply at the cheapest possible rate. We very much question whether the wisdom of Parliament will, under present circumstances, sanction two totally different supplies. What may be done, and what, if our Engineers will exert themselves, may possibly be accomplished, will be a mixed supply, in some respects purer, and at an increased pressure. This might involve no additional charge to the Metropolis, and, with proper districting arrangements, no discomfort to the inhabitants. In any case, the Metropolitan Water Question is a thing of the future. In some shape or other, it will last our time, and generations to come may be exercised over the aqueducts, the ruins of which the expected New Zealander will come to visit.

We rejoice to see that a certain amount of enthusiasm is springing up in support of Lord Camperdown's Bill. The shortcomings of the Metropolitan Board are pretty well known, though never made public. In these days the publication of disagreeable truths is a dangerous process, and, for our parts, wishing to lead a quiet life, we refrain from stirring dirty water. We wish to see the Metropolis, in its municipal associations, governed by gentlemen who intellectually and socially can adequately represent the wealth and intellect of the community. And what do we find? Let us drop a veil. Our readers can refer to a Directory or an Almanac, and see for themselves of what our two municipal bodies are constituted.

There are curious people in the world. The Local Board of Heywood went to Parliament last year in order to purchase the undertaking of the Water Company, in which they succeeded. The costs incurred appear to have amounted to £5232, and evidently some jealousy has sprung up, for one or two members of the Local Board are particularly anxious to know among whom this amount of money was divided. It seems to be tacitly admitted that Sir John Hawkshaw got the lion's share,



although he was *non est* when he was wanted in the committee-room. We can easily guess that the lawyers got the bulk of the rest. But then the small fry—the Members of the Local Board—came up, and had a private sitting-room, and, we suppose, dined sumptuously at the Westminster Hotel, with an *honorarium* of two guineas each a day. Moral for ratepayers: Every Purchase Bill must be paid for. It furnishes the opportunity for the jolliest holiday that a member of a Local Board ever had. *Verbum sap.*

Captain Calver's report has once more forced upon public notice the question of the possible utilization of London sewage, and all the old disputants, as far as we know, except Mr. Hope, have delivered themselves in newspaper correspondence on the subject. It is lamentable to see that we seem no nearer a solution of the question than we were twenty years ago. The formation of dangerous shoals, from the deposition of sewage mud, in the Thames, however, must presently lead to some alteration in the mode of disposing of metropolitan sewage. A possible change for the better is not, however, apparent. One thing seems certain; metropolitan refuse must be carried further and further down the river. Mr. Mechi still adheres to his notion that this refuse should be utilized by irrigation, but his ideas are perfectly chimerical. The vast volume of London sewage cannot be distributed by hose and jet over the most extensive area of land that could be placed at the disposal of the Metropolitan Board. Independent farmers, we venture to predict, would not think of buying sewage for more than six weeks in the year, and what is to be done with the stuff during the remaining forty-six? The only plan which, at the first blush, seems feasible to us, is a revival of the Maplin Sands scheme. It could not at once be remunerative, but, in the course of ten years, a considerable return might be expected. It would be a simpler plan to turn the sewage directly into the sea; but, little as is the value we put on diluted human excreta, we hesitate to countenance the waste, the like of which, as Baron Liebig showed years ago, must eventually end in the agricultural ruin of England. We are paying the penalty for the glorious invention of the water-carriage system. Perhaps we should not fare much better under an earth-carriage system; for a correspondent of *The Times*, who appears to have gone fully into the system, clearly shows that, in the earth-closets, the most valuable of the manurial constituents are rapidly oxidized, and almost completely disappear. The mineral constituents, of course, remain; but these are infinitesimal in quantity, and, although undoubtedly possessing a manurial value, have it but in small amount. It has been recently suggested that the earth-closet system might be applied to London; but we consider the application of this, or any other dry-carriage system, to be out of the question. We are condemned to the water-carriage system, and must do the best we can with it.

## PROGRESS OF CHEMISTRY.\*

### FIRST NOTICE.

Dr. Frankland's name is so intimately associated with the progress of chemistry during the last thirty or forty years, that this volume of his collected papers will be a welcome addition to the library of every chemist. To the section on "Pure Chemistry" we shall make no reference, although it will probably be considered to possess the greatest interest to scientific chemists. Premising that every line of the work has an interest, we turn to that part which deals with our special industry. Dr. Frankland has, in the course of his career, been extensively engaged with the manufacture of gas, with the practice of photometry, and the physical conditions which govern the illuminating power of gases. To all of these subjects he has brought all the exercise of an acute mind and careful experimentation. If we do not always agree with him in his conclusions, we may always admire the originality of the views, of the truth of which we are not convinced. On some points, however, Dr. Frankland perfectly convinces us. The gas supplied to the Metropolis in 1851, estimated by the illuminating value of its constituent components, was just as good as—perhaps a little better than—that supplied to-day; but the difference between the old iron burner and Sugg's New "London" Argand helps the gas to give an increased illuminating power of over 24 per cent. We fear the conclusion that Dr. Frankland has arrived at is but too true. The manufacture of gas has made no progress whatever since Murdoch put a shovelful of coals into his iron retort. Some mechanical inventions have tended to remove condensable impurities to some extent; but it has, we fear, to be confessed, that they have rather detracted from, than added to, the light-giving power of gas when consumed. Dr. Frankland, in his early days, had to investigate Stephen White's process for the production of what is known as "water gas," or the hydrocarbon process; and he has evidently a lingering expectation, which we share, that, in a modified form, like that proposed by Mr. Spice, a process of the kind may turn out of permanent value.

But, apart from this, he was a good deal occupied with the ordinary process of manufacture and the composition of coal gas, and we here make no excuse for quoting largely from the introductory chapter, which leads up to the researches on gas. Referring to the paper of Mr. T. S. Humpidge, which we published in our columns (Vol. xxx., p. 380), he remarks:—

These results show, firstly, that, notwithstanding the ostensible increase of illuminating power from 12 to 16 candles, in compliance with several Acts of Parliament, when the coal gas is consumed at the rate of 5 cubic feet per hour, the actual illuminating power has remained exactly the same; for the difference in 7.01 per cent. of olefiant gas, or its equivalent in other illuminating hydrocarbons, in 1851, and 7.02 per cent. in 1876, is too minute to be appreciable. The improvement of the coal gas sold in London has been only imaginary, for no real alteration has been effected. It has been made to appear better by testing it with improved burners; but, as consumed in the burners almost universally employed, it gives no more light in 1876 than it did in 1851—a conclusion which is confirmed by the results of simultaneous comparative trials made by Mr. Humpidge with two burners, one of them similar to those by which London coal gas was tested in 1851, and the other the so-called "Gas-Referees burner," at present employed in testing London coal gas. At 4 p.m. on the 6th of June, 1876, the gas supplied by the Chartered Company to the South Kensington Museum gave, when consumed at the rate of 5 cubic feet per hour from the 1851 test-burner, a light equal to 11.1 standard candles, and on the 28th of June, at 3 p.m., a light equal to 10.5 standard candles; but when the same gas was tested at the same hours by the present Referees burner, it gave, when consumed at the same rate, a light equal to 14.3 candles on the 6th of June, and a light equal to 14.5 candles on the 28th of June.

As regards cannel gas, the condition of London is far worse in 1876 than it was in 1851. Coal gas is not suitable for use in dwelling-houses, by reason of its very low illuminating power. One hundred cubic feet of coal gas contain only 4 cubic feet of illuminating gas, the rest is mere rubbish, which heats and pollutes the air in which the gas is consumed. Cannel gas contains from two to four times as much illuminating gas; and therefore its consumption affects the air of rooms to a far less extent, because a much smaller volume of it is required to produce a given amount of light. Now, in 1851 a large area of the West-end of London was supplied with cannel gas of such an illuminating power that a flame burning 5 cubic feet per hour gave a light varying from 27 to more than 30 standard candles. About two years ago the supply of cannel gas to private consumers was suddenly discontinued without their consent, and it has since been supplied only to the Houses of Parliament, and to some of the Government Offices. Its illuminating power is less than that of the cannel gas of 1851, still, when consumed at the rate of 5 cubic feet per hour, it sometimes gives a light equal to 27 standard candles.

It cannot be too widely known that coal gas, though it costs less per 1000 cubic feet, is, light for light, much dearer than cannel gas. Thus, to give the light of 1000 cubic feet of cannel gas consumed from a bat's-wing or fishtail burner, and costing 6s., about 2000 cubic feet of coal gas, costing about 8s., would be required. The difference can, it is true, be diminished by the use for the coal gas of the elaborate and expensive burner employed for the official testing of the gas; but the consumer's burner is the fishtail or bat's-wing, costing 1d., and it can never be extensively replaced by the official burner, which costs 5s., and requires the use of a fragile glass chimney.

This statement is undoubtedly true, but our readers know that we have always advocated the use of gas of low illuminating and highly-heating properties, the reason for which must be apparent to every one. Taking the one point first, everybody knows that the use of two or three fishtail burners in a moderately-sized sitting-room enables the dwellers to dispense with the use of a fire. When the Western Company supplied their district with what Dr. Frankland calls 27-candle gas, the universal complaint was that it simply blackened the ceilings. We could mention first-class engineers who prayed for its discontinuance, in the belief that it only produced soot. There was, of course, a fallacy in this, for, if but a little pains had been taken in regulating its combustion, all the evils complained of might easily have been remedied. Our belief is that everybody but Dr. Frankland, resident in the Western Company's district, is heartily glad to be rid of cannel gas.

There is an especially interesting chapter on the Point of Ignition of Coal Gas, the experiments on which were originated by an explosion in Holborn, supposed to have been caused by the contact of an explosive mixture of coal gas and air with molten lead. The results are of singular interest to miners and gas manufacturers. It is not a novelty, but the difficulty of igniting marsh gas may well be remarked; but still more remarkable is the fact that the mixture of a small quantity of olefiant gas with gases and vapours having so low igniting points as carbonic oxide and bisulphide of carbon, enormously raises the inflaming point. We fear that much contained in this chapter has escaped recollection, and for this reason we here especially refer to it.

An interesting chapter is devoted to the description of a burner which Dr. Frankland devised for heating atmospheric air before it came into contact with coal gas in the process of inflammation, whereby the illuminating power of that gas was largely increased. The burner has almost passed out of recollection, but we entertain an expectation of seeing it revived some day in a new patent.

KIDSGROVE GAS COMPANY.—A new gasholder and tank have just been completed at the works of this Company, at Harding's Wood. The six massive columns and lattice girders have a very noble appearance, and the work throughout is exceedingly well designed. The holder, which is 50 feet in diameter and 16 feet deep (made to telescope), and the whole of the ironwork, which is of the best material and workmanship, and does great credit to the contractor, was made and erected by Mr. George Barker, Union Foundry, Kidsgrove. The plans and specifications were prepared by the Company's Manager, Mr. J. Davies, and the whole of the works, which were commenced last April, have been carried out entirely under his directions, and, as now appears, to a very satisfactory result. Very serious difficulties had to be overcome during the progress of the work, owing to the proximity of the buildings and the other tanks.—*Staffordshire Sentinel.*

\* "Experimental Researches in Pure, Applied, and Physical Chemistry." By Dr. Frankland, Ph.D. (Marburg), D.C.L., F.R.S., &c., &c. London: Van Nostrand, 1877.



## A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

## CLIV.

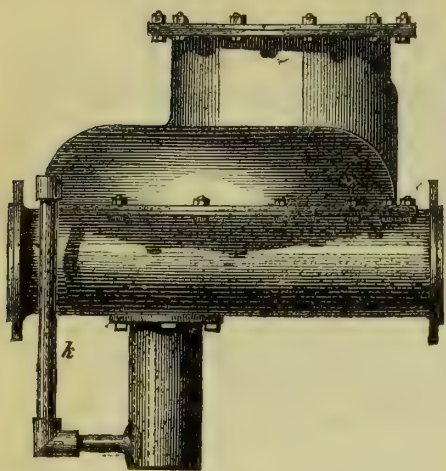
DISTRICT GOVERNORS (*continued*).

FIG. 4.

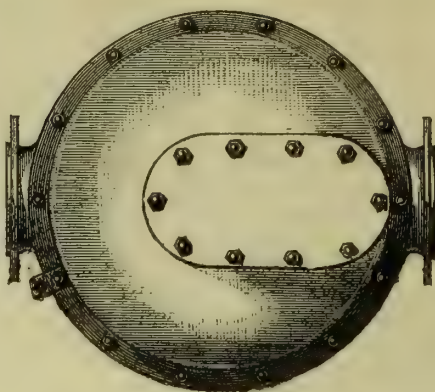


FIG. 5.

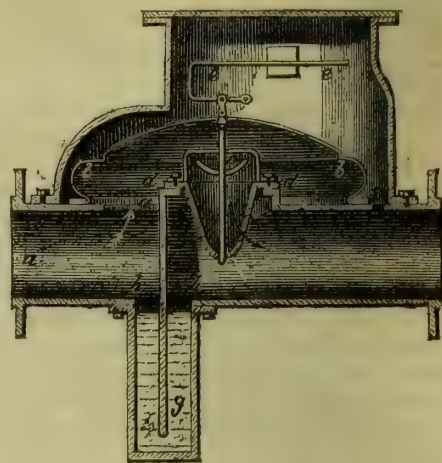


FIG. 6.

The district governor of Mr. E. S. Cathels is shown in elevation, plan, and section in figs. 4, 5, and 6. The principle of its construction is exactly that of a reversal of the ordinary station governor; the usual outlet being made the inlet, *a*, and *vice versa*. The inlet pressure thus exerts its force freely under the diaphragm, *b*. The cone, *c*, is suspended above instead of under the opening, or seat, *d*, and its apex is turned downwards, so that instead of its being drawn up into its seat and reducing the gas-way by the increased pressure, as in the ordinary governor, it is lifted out of its seat, enlarging the passage for the gas, and so increasing the outlet pressure; again falling, and diminishing such pressure in proportion as that at the inlet is reduced.

The space, *e*, above the diaphragm is air-tight, and is in connection with the outlet by means of the opening or vent, *f*, so that it is impossible for the cover to fall and stop the gas-way, however sudden or great the draught on the outlet may be; because the draught will affect such space to the same extent as the main, and the downward or closing pressure on the diaphragm being removed to the same extent as the inlet or upward pressure, the gas-way remains as before.

The diaphragm, *b*, is a metallic plate with a leather hinge. The adjustment to any desired pressure is made by the counterpoise weight on the lever, and, when once fixed, the apparatus is entirely self-acting, the outlet pressure being the governing power. When the governor is fixed, the seal-box, *g*, is filled with water through the filling-pipe, *k* (fig. 4), any fluid accumulations in the main passing through the holes, *h h*, from the upper to the lower side of the partition.

The governors are fixed in the line of main in which the pressure is to be reduced, at such distances apart as may be considered necessary; the closer they are together, the better, of course, will the pressure be controlled. Generally speaking, one governor at each 50 feet difference in elevation may be adopted.

The differential gas-governor of Messrs. J. and J. Braddock is shown in fig. 7. Like some of those already illustrated, it is attached

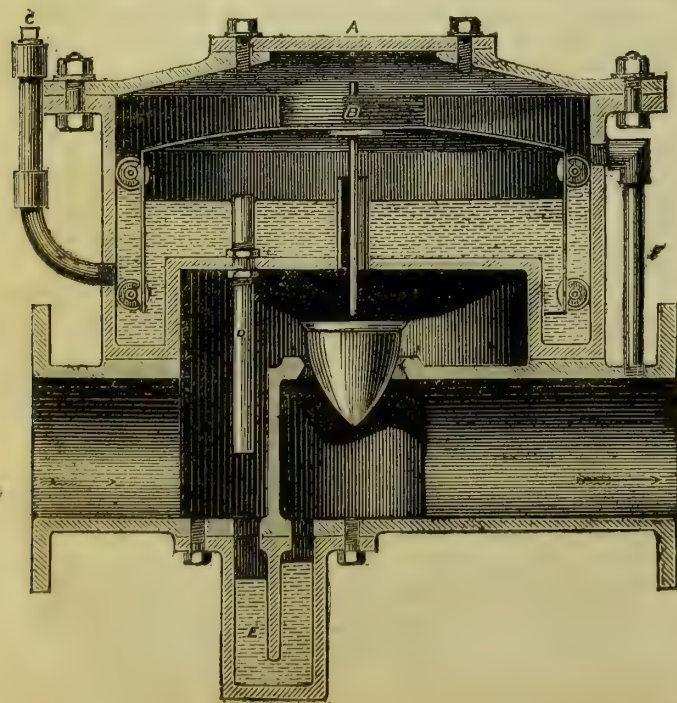


FIG. 7.

in position without deviating from the line of main at the point where it is placed. It consists of a shallow cast-iron box containing the governing bell, and covered with a strong lid, the centre part, *A*, of which is removable for the purpose of periodical examination and adjustment with the lead weights or washers, *B*, placed on the crown of the bell. *C* is a tube for supplying the governor with water when required, which overflows by the tube, *D*, into the seal-cup, *E*, the surplus water passing off down the main to the nearest syphon-well. The tube, *D*, also acts as a means of supplying the inside of the bell with a pressure of gas equal to the inlet pressure, the pipe, *F*, acting in the same manner for the outlet pressure into the chamber above the bell, so as to enable the one to counteract the other. The governor shown is for a 6-inch main, and the space it occupies above the pipe is only about 12 inches. The principle is that of Mr. Cathels's governor, but a water-seal is adopted instead of the hinged diaphragm.

The apparatus illustrated in fig. 8 is the district governor of Mr. D. Bruce Peebles, and it presents various features of an interesting

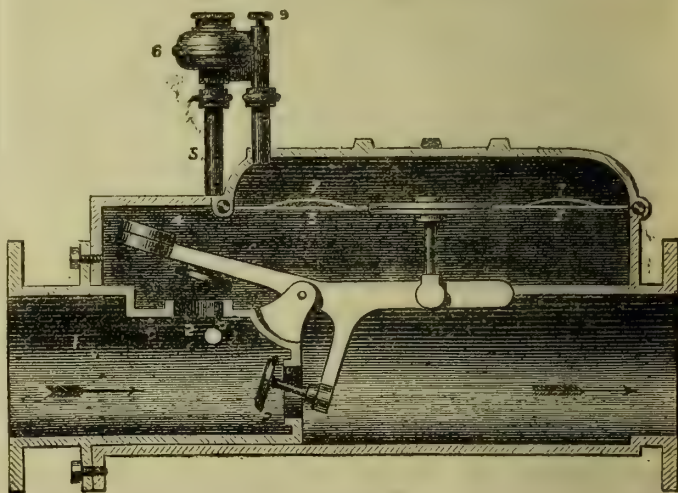


FIG. 8.

and novel kind. The outer case is of cast iron; it occupies but little space, and is fixed on the direct line of the main. The gas entering by the inlet (1) in the direction of the arrows, passes through the valve openings (2), and presses upon the underside of the flexible diaphragm (3), which is connected by a vertical rod to the lever actuating the valves. This force tends, in conjunction with the weight (4) on the end of the lever, to close the valves; but the inlet gas passing through the pipe (5) to the upper side of the diaphragm (7), induces a contrary action, tending to open the valves. On the top of the vertical pipe (5), however, a small governor (6) is fixed, and this can be adjusted to give any desired pressure. Alongside of the small governor is a screw-valve (9), employed to establish the minimum day pressure. The method of adjustment is as follows:—When the day pressure is on at the works, the district day pressure is established by keeping the valve of the small governor entirely open and out of action, and moving the screw-valve until the required day pressure is obtained. The night pressure is then put on at the works, and the small governor adjusted to give the desired night pressure in the district, which is done by weights inserted through the orifice at the top, the screw cap being removed for that purpose. This pressure cannot then be exceeded unless an alteration is made in the weighting of the small governor. The maximum and minimum pressures are thus both under command, and the apparatus being automatic, requires no attention after being once set.

(To be continued.)



## LIGHTING BY ELECTRICITY.

(Continued from Vol. xxx., page 984.)

We have, so far, been considering what can be done with electricity when employed in an electric lamp of the most improved principles; and, for reasons that will appear in the sequel, we shall now make a few remarks respecting the important part that that portion of the lamp plays called the regulator. The efficiency of the lamp is, without doubt, due to the beautifully automatic machinery within its base, and the name of the inventor of this so-called "clockwork" attaches to the lamp, and becomes the name by which it is known. As there are, at least, half a dozen inventors, so we have as many different sorts of lamps, all of which are, more or less, approved of. The lamp we have illustrated\* is the invention of M. Halner-Altenack, and is constructed by MM. Siemens and Halske, of Berlin. As it is said to be efficient it was selected, for the purpose of showing what the regulator of a lamp has to contend with, in preference to those of other inventors of repute that are more complex. We do not, in this place, pretend to judge of the merits of such apparatus in connection with the work for which it is designed; and, at the same time, we desire to avoid being accused of selecting a lamp with a regulator of a more formidable aspect.

When the light is going, the demand on the regulator is incessant, and the adjustment so minute that nothing but well-contrived and carefully-constructed machinery can in any way cope with the requirements. There is the dispersion of the carbons, which every moment tends to widen the space that the light occupies, and which would in a few moments become too great for the "voltaic arc" to overspan if it were not for the vigilance of this train of wheels, the result being that the light would be lost. Again, there is the varying density of the carbon. This is a source of disturbance that requires compensating, as also do the fluctuations that take place in the current, due to the variations in the speed of the machines producing it. Should a carbon split, and a piece fly off, immediate and very active service is demanded of the regulator, to save the light; or, if lost, to reproduce it in a short space of time, by bringing together the carbons in such a manner as not to do further injury to their ends by abrupt contact. All these incidents, and more, the regulators have to take account of; we need not, therefore, wonder at the display of the clockmaker's art that is found in these lamps, nor be surprised that the complete apparatus occupies a considerable space. If, instead of all this contrariety, we could secure certainty of action, by obtaining carbons of such a nature that their dispersion would be constant, provided the electric force were equable, and that this condition of current also could be obtained, a very different state of things would prevail. We should then have only to keep the carbons at the distance which was found to give the maximum light, and to maintain them in that position. This would be easily done by allowing the carbons to approach each other at the rate at which they decreased in length for any given period; but, at present, this is an impossibility. Hence the necessity for providing each lamp with an elaborate piece of mechanism, called the "regulator," in order to correct, or, rather, eliminate the effects of the disturbing causes just mentioned.

There is also the inconvenience of having to replace the carbons every three or four hours, even when the lamps used are of large dimensions. For this no remedy has, as yet, been devised; but, knowing that inventors are turning their attention to the subject, we give an illustration and description of an invention which shows the first departure from the beaten track, and which has led to other contrivances having in view the remedying, if possible, of the last-named difficulty, and also the maintenance of the distance of the carbon points so as to fully develop the light.

In the case referred to, instead of employing carbon crayons placed end to end, which shortened every moment while the light was going, and, therefore, required perpetual re-adjustment for distance, by some means or other, not then automatic, the inventor employs discs of carbon, distanced, after first contact, by hand, to the extent necessary for giving full effect to the electric current at his command. These discs are to be revolved by "clockwork." This would cause fresh surfaces to become adjacent every moment, and thus the required space for the full development of the light of which the battery power is capable, is kept by a sort of adjection, rather than, as now, by adjustment. This will continue to be the case until the discs have made a complete revolution; what takes place after this we are not told.

The inventor, Mr. Thomas Wright, thus describes his invention in the specification of his patent, dated March 10, 1845, and from which the annexed drawings, figs. 8 and 9, are copied:—

A is a double annular frame of wood, or other non-conductor of electricity, between which are placed five (or other number of) discs, B<sup>1</sup>, B<sup>2</sup>, B<sup>3</sup>, B<sup>4</sup>, B<sup>5</sup>, mounted upon axes revolving in bearings attached to the frame, A. These discs consist of two circular plates of brass or other metal, between which are placed circular discs of plumbago or carbon (the latter being preferred), about a quarter of an inch in thickness, and somewhat larger in diameter than the containing metal plates, having angular or V-shaped edges. The discs, B<sup>1</sup>, B<sup>3</sup>, B<sup>5</sup>, are mounted in bearings affixed to the frame, A, but the discs, B<sup>2</sup>, B<sup>4</sup>, are mounted in sliding carriages capable of being advanced forward or drawn backward by means of the adjusting screws, C<sup>1</sup>, C<sup>2</sup>. These discs are set in motion by means of a band passing round pulleys on their axes, and connected with wheelwork actuated by a weight or other prime mover, so as to cause the several discs to revolve with a slow uniform motion. On passing a current of electricity through the whole series of discs while they are rotating, a brilliant light is produced at the edges of the discs that are adjacent to each other. This may be accomplished by connecting one wire of a galvanic battery with the axis of the disc, B<sup>1</sup>, and the opposite wire with the axis of the disc, B<sup>5</sup>; but, in order to economize the power, I prefer to separate my battery into four parts, and transmit a separate and distinct current to each pair of discs, as shown in the drawing. In order to bring about the desired effect,

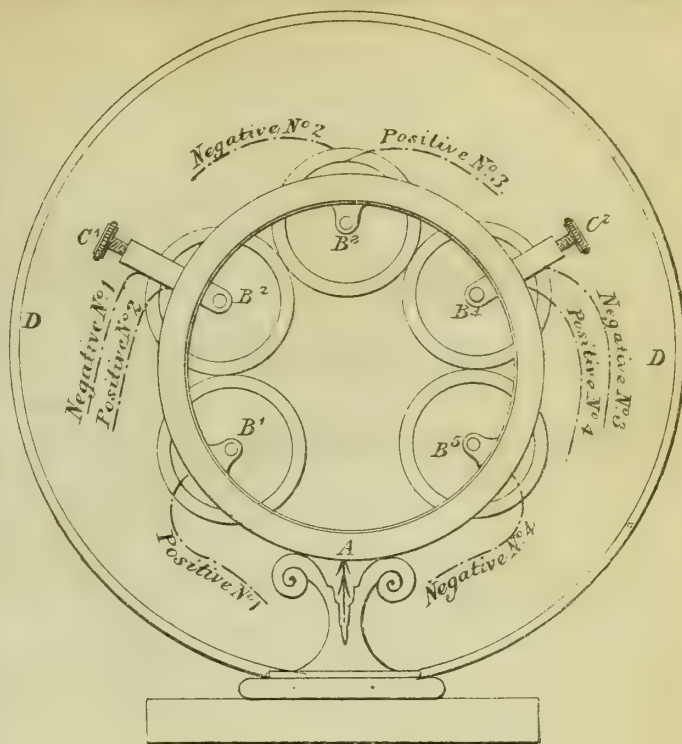


FIG. 8.

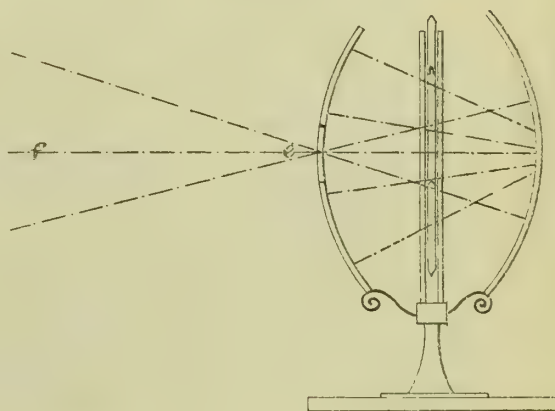


FIG. 9.

the discs, B<sup>2</sup> and B<sup>4</sup>, are to be brought in contact with the adjacent discs, B<sup>1</sup>, B<sup>3</sup>, B<sup>5</sup>; and as soon as the electric current is established, and the points of contact sufficiently ignited, the discs, B<sup>2</sup> and B<sup>4</sup>, are to be withdrawn out of contact, when a brilliant and permanent light will continue to be evolved at the several proximate portions of the discs, so long as the electric current passes and the discs continue to revolve. For the equable diffusion of the electric light thus obtained, I enclose the apparatus hereinbefore described within a globe of ground glass, as shown at D; or if the whole of the light is required to be thrown in one particular direction, I employ a suitable arrangement of reflectors, one of which is shown at fig. 9, whereby the whole of the light is thrown in the direction, e, f.

Thirty-two years afterwards—i.e., on May 16, 1877, Provisional Protection was obtained by Mr. F. W. Heinke, for "Improvements in the method of and apparatus for obtaining or producing electric light." The inventor makes no pretensions to improvements other than the getting rid of the regulator of the electric lamp, as now in use, and the necessity for replacing the carbons at such short intervals, as is the case at the present time; but still his lamp is as much encumbered with "clockwork" mechanism as anything of the present day, which the following extracts will abundantly prove:—

In carrying my invention into effect, I provide carbon discs or electrodes, which are caused to rotate in contrary directions, and to work against one another, preferably at right angles, or nearly so, to one another; for this purpose I mount one disc on an axis, to which rotary motion is imparted by clockwork, or in any other convenient way. Supposing this disc to be set to revolve in a horizontal direction, I provide another carbon disc, placed in a vertical direction upon an axis, which is also caused to revolve by clockwork mechanism; the two discs I prefer should revolve synchronously, but they may revolve, if desired, at different speeds. For this purpose I provide a train of wheels suitably arranged for that purpose; the two carbon surfaces thus revolving, a separate and distinct surface of carbon is successively and continuously exposed to the action of the current of electricity. . . . To provide for the wear of the discs, one of them during its revolution is brought up to the other a regulated distance, at, say, each complete rotation of the discs, and this is accomplished by connecting the frame carrying its axis with the train of wheels and clockwork mechanism aforesaid. . . . The edges of the carbon disc or electrode are preserved during their rotation with suitable edge by providing metal or composition sharpening appliances, between or through which they pass, and thus the discs are set at each rotation thereof. . . . The speed at which the discs rotate varies according to circumstances. . . . When bars or rods are used instead of discs, I cause them to have a reciprocating motion, and provide adjusting and sharpening arrangements as before.

(To be continued.)

SALE OF GAS SHARES.—At a sale by auction on the 27th ult., three £10 ten per cent. shares in the Kidsgrove Gas Company sold for £62.



## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

## PORTLAND CEMENT CONCRETE.

SIR,—I am anxious to defend the good name of one of the most valuable—for many purposes the most valuable—of all our building materials—viz., Portland cement concrete. In your last issue, on p. 19, there is a reference to my concrete tank, from which the writer, Mr. Chatto, draws the “conclusion that tanks built entirely of concrete are not to be relied upon.” This conclusion is not now correct. The tank, when first filled, did leak at the rate stated; but this rate of leakage gradually decreased in the course of twelve months, until the 6 inches in depth of water that was lost daily at first was reduced to less than 2 inches. A diver was then employed, who succeeded in completely stopping the leakage. This was done in December, 1876, and during the greater part of last year there was an overflow of rain-water from the tank.

I would, moreover, point out that, had the tank been made watertight with puddle, as is usual with brick tanks, there would have been no cracks, but depending as it did for soundness entirely on a thin skin of cement rendering, it was altogether an exceptional work, and as such no comparison can be made with brickwork made tight by puddle.

I am very glad it did leak, for two reasons. In the first place, the cause of weakness has been discovered; and in the second place, it is now known that any cracks that may occur in a tank of this description can be stopped.

I am so satisfied of the superiority of this description of tank, that in any future tanks I may be called upon to construct I shall follow this plan, unless the ground consists of clay, in which case I should use concrete, and dispense with the rendering.

GEORGE LIVESEY.

South Metropolitan Gaslight and Coke Company,  
589, Old Kent Road, S.E., Jan. 5, 1878.

## CORRECTIONS.

SIR,—There is a misprint in p. 12 of the JOURNAL of Jan. 1: “Such leakage being in the proportion of the square root of the pressure,” instead of “in the *inverse* proportion” or “inversely as.”

You will, perhaps, think me an ultra-purist if I also object to the expression in the first paragraph of the article: “The pressure of the gas in the mains varies,” &c. Of course, what is meant is “the pressure as read off from the gauge which is in communication with the atmosphere.” But accuracy of language is one of the lessons which science may be expected to teach and insist on.

I ought not, however, to presume to offer so minute and, as most practical men will say, trifling a criticism, without at least suggesting a correction; so I venture to propose: “What is technically or practically called the pressure of the gas, as indicated, at any point of its course, by the pressure-gauge, varies,” &c., instead of the words, “The pressure of the gas in the mains varies,” &c.; for, although the matter is afterwards thoroughly explained, yet, in my opinion, it is better to avoid a directly inaccurate expression. And this objection impressed itself on me at once as I read the first paragraph, without looking further.

Will you also pardon me if I call attention to the want of typical precision in the formula for paraffin in the first column of the same page? Instead of  $C_nH_{2n+2}$ , it should, of course, be  $C_nH_{2n+2}$ . The same typical inaccuracies occur in the formulæ quoted from Dr. Mills's work, in the preceding page.

Sidney Sussex College, Cambridge, Jan. 3, 1878.

ROBT. PHELPS.

## Legal Intelligence.

## WORSHIP STREET POLICE COURT.—SATURDAY, JAN. 5.

(Before Mr. BUSHBY.)

## METROPOLITAN BOARD OF WORKS v. THE GASLIGHT AND COKE COMPANY.

In this case The Gaslight and Coke Company were sued by the Metropolitan Board, under section 50 of their Act, 1876, to recover penalties for supplying gas from their Shoreditch works, on the 11th ult., of less illuminating power than 16 candles, as prescribed by section 25 of the said Act.

Mr. FRY (from the office of the Solicitor to the Board) attended to prosecute, and Mr. BEDFORD (of the firm of Curtis and Bedford) appeared for the Company.

The MAGISTRATE (on taking his seat on the bench) said: I would suggest to the parties in this case that the hearing had better be adjourned until Tuesday or Wednesday next, when Mr. Hannay will be sitting here. I have been so recently connected with this Company that I think it very desirable I should not try the case. I would ask those who represent the parties whether Tuesday or Wednesday would suit them best.

Mr. FRY: I am afraid, sir, that we must go on with it. The 54th section of the Act says, “The forfeiture shall be leviable by distress, and on proof of any such report before two justices or a magistrate at any time within one month after the date of the report, such justices or magistrate shall issue their or his warrant of distress accordingly.” The month in this case expires on the 11th inst. What I should propose is that I should tender formal proof of the report now, then there will be no difficulty.

The MAGISTRATE: What section are you quoting?

Mr. FRY: The 54th—the last part of it.

The MAGISTRATE: The report has to be proved?

Mr. FRY: Yes.

Mr. BEDFORD: I think I can save you trouble.

Mr. FRY: I am prepared with proof of the report. But let me say this: I understand that the other side do not intend to defend the case, so that if I put in my formal proof I shall ask for your order.

Mr. BEDFORD: We do not wish for an adjournment, because we do not contest the matter.

The MAGISTRATE: Very well.

Mr. FRY: Sir, these proceedings are taken by the Metropolitan Board of Works, who are the Local Authority under The Gaslight and Coke Company's Act, for the purpose of asking your warrant of distress against them for forfeitures which they have incurred under section 50 of that Act, which I now put before you. I think it will be convenient if I at once read that section. It is sec. 50 of the 39 & 40 Vict., c. 225, and it is in

these words: “If on any day the gas supplied by the Company from any station is of less illuminating power than it ought to be under this Act, the Company shall be liable to the following forfeitures:—For the first half of a candle of defective power, forty shillings.” That does not affect this particular application. The next paragraph does: “For the first and every subsequent candle of defective power, a sum equal to the value of the defective power, estimated at the rate of twenty shillings for every half candle of defective power on every one hundred thousand cubic feet, or any fractional part less than one hundred thousand cubic feet of gas, whether common gas or cannel gas respectively, delivered from that station on the day of default.” Now, sir, I have here the certificate of a gentleman of very great experience in these matters, who has seen the books of the Company, and ascertained what that amounts to. But perhaps it will be convenient if I now refer you to the sections which bear upon the case, so as to show you precisely how these proceedings have arisen. Sir, if you refer first of all to section 38 you will find provision for the appointment of Gas Examiners. I am prepared to produce formal proof of the appointment of the gentleman by whom the examination of the gas complained of was made. Then the next section makes provision for the appointment of a Chief Gas Examiner, and section 40 relates to the daily testing of the gas. It says: “A Gas Examiner shall at each testing-place make daily such number of tests as the Gas Referees may prescribe for ascertaining whether during the whole of each day the illuminating power, purity, and pressure of the gas supplied by the Company are such as are respectively prescribed under this Act, and in the event of the same being ascertained to be defective in any particular, he shall forthwith give notice thereof to the Company.” Now, sir, on the 11th of December last the Gas Examiner at the Graham Road testing station examined the gas supplied by the Company, and found that instead of the gas giving an illuminating power of 16 candles it had only an illuminating power of 14.7 candles, so that there had been a falling off of more than one candle, and I am asking now for the forfeiture in respect of that one candle, as fixed by section 50 of the Act to which I have already drawn your attention. You will see that section 49 has reference to the register of the gas made by the Company, and requires them to afford access thereto, at all reasonable times, to the Board, and I may say that the Company have afforded every facility for the gentleman who attended at their works yesterday, and they produced their books for his examination. The penalty, you will have observed, is fixed at 40s. for every candle of deficiency upon each 100,000 cubic feet, and, taking the fact that on the 11th of December last 3,654,000 cubic feet of gas were made at the station of the Company at Shoreditch, he has calculated, according to the method pointed out in the section, that the forfeiture to which they are liable amounts in round numbers to £74. That is the amount of forfeiture the Company have incurred, and for which I ask your warrant. Then you will see that section 46 of the Act provides for an appeal to the Chief Gas Examiner, “If the Company think themselves aggrieved by any report of a Gas Examiner, they may within seven days after the day on which that report is delivered to the Company appeal to the Chief Gas Examiner, whose decision, after hearing the parties, shall be final and conclusive, and the Chief Gas Examiner shall report every such decision to the Corporation and the Metropolitan Board.” I should mention that there has been an appeal, but it has been without any result. I have now the Chief Gas Examiner's report, which I shall produce before you. Section 47 says, “If in any case the Company do not appeal as aforesaid, the report of the Gas Examiner shall be final and conclusive.” What I shall rely upon, therefore, is the report of the Gas Examiner for the day in question, showing that there was a deficiency of illuminating power. Section 49 provides that the Company shall keep a register of the gas made at each station, and that is the one to which I have referred. I have also referred to section 54, which relates to evidence of liability to forfeiture, and states that, on proof of the Gas Examiner's report before two Justices or a Magistrate within a month, a warrant of distress for the amount of the forfeiture shall issue. What I propose to do is—first of all to call a gentleman from the Board of Trade, who will produce the original appointment of the Gas Referees; then I shall produce the certificate of the Gas Examiner, which I shall rely upon as showing the deficiency of illuminating power, as I have described, and then I shall put in the formal appointment of the Gas Examiner who made this report. But I am told the Company admit all this.

The MAGISTRATE: It seems extraordinary that you should have to prove the appointment of these officers.

Mr. BEDFORD: We do not require it at all; it is wasting your time.

The MAGISTRATE: If you wish to do it you can do it.

Mr. FRY: I am only trying to follow out the course adopted by the City Solicitor in a case which was heard seven years ago at the Mansion House.

Mr. BEDFORD: That was a case which we contested.

Mr. FRY: I am entirely in your hands.

The MAGISTRATE: There can be no admission of guilt in a criminal case, but with reference to the appointment of officers, unless it is contested it is not necessary to prove it. If a gentleman gets into the box and says, “I am the Chief Gas Examiner,” it is conclusive unless it is questioned in cross-examination.

Mr. FRY: It was only because the section to which I have referred says, “On proof of any such report.”

The MAGISTRATE: Yes; proof of report.

Mr. FRY: Then I will simplify it very much by calling the Gas Examiner at once.

The MAGISTRATE: Unless they cross-examine the witness in the box.

Mr. BEDFORD: In the case at the Mansion House seven years ago we did strongly contest everything. We do not do so now, and we do not wish to take up your time.

Mr. Henry Leicester Greville was then called. He said I am the Gas Examiner appointed by the Metropolitan Board of Works for the district of Shoreditch. I hold in my hands a certificate of the illuminating power of the gas made at the Shoreditch works of the Company on the 11th of December. The examination was made at the Graham Road testing station. The tests were made in the manner prescribed by the Instructions of the Gas Referees. There were three tests. The result was that, during all the hours of testing on that day, the illuminating power was 14.7, or rather more than 14½ candles—i.e., rather more than one candle short of the standard. The report I have here is the original report.

Mr. FRY: I shall now call Mr. Keates to show the quantity of gas made at that station on the day in question, so that you may be able to arrive at the amount of forfeiture.

Mr. T. W. Keates: I am Consulting Chemist to the Metropolitan Board of Works and their Chief Gas Examiner. I was instructed to apply to the Company to examine their register of the gas made at these works on the 11th of December last. I attended at the office yesterday and examined the ledger accordingly. I found that on that day they delivered 3,654,000 cubic feet of gas. That properly calculated out in hundreds of thousands will give about 36½—virtually 37—quantities of 100,000 cubic feet each. The penalty, therefore, being 40s. for each 100,000, the whole amount of forfeiture is £74.

The MAGISTRATE: And that is not contested.

Mr. BEDFORD: No. I have nothing to ask Mr. Keates.



Mr. Fry: I may just add that though there is no wish on the part of the Board to press severely on the Company, I am afraid I must ask you for the full amount of the forfeiture. I think you cannot mitigate it.

The Magistrate: So it appears.

Mr. Fry: It is not the object of the Board to persecute the Company; their only desire is to look after the interests of the public. They are the Local Authority to which Parliament have confided this duty. There was another prosecution recently instituted by them against the Commercial Gas Company, not for a similar offence, but for another offence under a Gas Act, and the Board felt then that they had no alternative but to take those proceedings to show that they were doing their best to fulfil the duty which has been cast upon them by the Legislature. That being so, of course, they find that in the present instance they cannot make any exemption in the case of one company more than another, and it seemed to them a matter of duty to bring the matter before the Bench and leave it, sir, in your hands.

Mr. Bedford: As I before said, my clients do not contest these proceedings. They admit their liability, and they admit also the amount of the penalty incurred—viz., £74. I am afraid it is a fact that, under the Act cited, you, sir, have no option, and cannot remit any portion of that penalty. We therefore consent to it as far as that part of the case goes. But I think it is only fair to my clients, The Gaslight and Coke Company, that I should say a very few words as to the cause of these proceedings. I do not complain of the Metropolitan Board of Works for having taken out this summons, although I am glad to see, from the reports in the daily papers, that there was a considerable division at the Board yesterday as to the advisability of carrying the proceedings any further. At the same time, we feel that the Board are only doing what they conceive to be right in the interests of the public, and, therefore, though we were in hope they would not have carried the matter further, we do not complain of the course they have adopted. But, sir, I desire to show you how anxious the Company are to fulfil the obligations which the Act of Parliament imposes upon them. You will have observed, in looking over the Act, that the standard of illuminating power for the gas supplied by the Company is 16 candles; and I think I may safely state that for the last seven years and upwards the reports of the Gas Examiners will show that the public have been supplied by the Company with gas of 17, 17½, and even 18-candle power. We received no extra price for that additional value, and I may almost say that we have received no gratitude for it. I see by the reports of the Superintendent of the station in respect of which these proceedings have been taken, that during the last year the illuminating power of the gas was as follows:—January, 17·3 candles; February, 17·7; March, 18·3; April, 18·2; May, 17·9; June, 18·1; July, 17·9; August, 17·6; September (which is the lowest of all), 16·8; October, 17·4; November, 17·2; and December, 17·0; giving an average of 17·61, or more than 17½ candles as the illuminating power of the gas supplied from that station to the public during the whole of 1877; the obligation upon us, under our Act, being only 16 candles. I am told also that during the past year there was sent out from this station alone 762 million cubic feet of gas of the high average illuminating power I have mentioned. I only state these things in fairness to the Company, and in order that the public, who sometimes give Gas Companies rather hard rubs, and seem to think they do not always get what they pay for, may know the real facts. And as it may appear in the papers that my clients are now charged with supplying gas of less illuminating power than is required by their Act, I think the other side of the case should be put forward, and that it should be known that for seven years there has not been a single prosecution for deficiency of illuminating power, nor for any default in the purity of our gas, until this unfortunate circumstance arose which has brought us here to-day. I should also state that, though we do not in any way contest these proceedings, it is very curious how this fault has arisen. It is one which completely puzzles all the officials of the Company. I dare say, sir, that you are perhaps aware that in addition to the official testing-station, the Company, under their Act, have power to maintain a testing-station of their own upon the works, and to conduct their own tests. Such a provision exists at the Shoreditch works, and, curiously enough, the testings of gas there taken, on the very day on which at the official station the tests showed an illuminating power of only 14·7 candles, gave a record of 16·2 candles. One would have thought also that the public, who are so apt to grumble at the Companies, would on that occasion have made numerous complaints of defective illuminating power; but, curiously enough, we did not have a single complaint from any of our customers. I can only conceive, therefore, that, from some cause which has not been discovered, this deficiency must have been localized, and that the gas which passed through the main to the official testing-station did not pass on to the general public. It is some satisfaction to the Company to know that, though they have incurred a legal forfeiture of £74, they have not broken faith with the public, who have been supplied with the same good gas as before. These facts were laid before the Metropolitan Board of Works, and I should have thought, under the circumstances, that they would not have taken these severe proceedings under the rather stringent penalty clauses of the Act. I do not know that I need trouble you further, but I thought you would feel it right that this side of the case should be put before you, and that it should be shown that the Company do deal liberally with their consumers, giving them generally gas which is from 1 to 1½ candle higher illuminating power than they are required to give by the statute. I would only add that, such being the case, we much regret being brought here to-day. It does seem rather hard that when a Company have supplied a considerably higher quality of gas than they are obliged to do for a period of seven years, for which additional service they get no credit or benefit, yet the moment that for 24 hours the gas drops below the standard they are mulct in the heavy penalty of £74. We, of course, cannot prevent that. We did the best we could to get an average clause inserted in the Act, but we did not succeed, and must therefore be content to pay the penalty.

The Magistrate: I should not, of course, make any remark upon the interesting statement which Mr. Bedford has made, and I am the more careful not to do it as I have been so recently connected with the Company. My duty on this occasion is simply executive; I have only to issue my warrant for the £74.

Mr. Fry: I do not know whether I should say anything about the costs. I may state that the whole of the £74 goes to the Receiver of the Metropolitan Police, and I think it is only fair that the Metropolitan Board should be recompensed for their expenses. I would only ask for ten guineas, or something like that, as costs.

The Magistrate: We are not in the habit of giving costs here. If there has been anything like a factious opposition to a legal claim, then sometimes costs are allowed; or, again, in such a case as this, if the party had offered an opposition to the inquiry, it might be done. But here the Gas Company have offered no obstacle, and do not raise any factious opposition.

Mr. Fry: At the same time the Board have been put to ten guineas costs, for money out of pocket, and it is rather hard that the ratepayers should have to pay it.

The Magistrate: The ratepayers? How so?

Mr. Fry: Yes; because the expense of carrying out the Act is payable by the ratepayers out of the general funds of the Board. I think to that extent it is only fair and reasonable, and I trust you will see it to be so, to make an order for the costs. It is no consideration to the Gas Company.

Mr. Phillips: I beg your pardon.

The Magistrate: I shall follow the example set by my colleague in the last case decided here, that of the Commercial Gas Company, and allow merely 2s. costs.

#### BRIGG PETTY SESSIONS.—TUESDAY, JAN. 1.

##### CONVICTION FOR NON-PAYMENT OF GAS-RATE.

Mr. George Eyre, of Caistor, was summoned for non-payment of a gas-rate amounting to 4s. 10½d. The case was originally before the Bench on the 18th ult., and was then adjourned for the production of proof of the appointment of the gas inspectors.

Formal evidence in support of the case having been now given,

Mr. Priestly, who appeared for the defendant, contended, first, that the complainant, the Overseer, having failed to give seven days notice before demanding the rate, could not get it in the way sought; secondly, the Inspector had not complied with the requirements of the Act for lighting and watching a town, by placing lamps at all reasonable places, as there were several houses where Eyre lived and no lamp there; thirdly, the Overseers had levied a rate for more money than the Inspectors agreed upon; fourthly, that at the meeting convened for the adoption of the Act the Chairman refused to entertain a proposition by one of the ratepayers for an adjournment of the meeting for four months, thereby making all subsequent proceedings illegal.

The Chairman said they had given the case a fair consideration, and they regretted to say, on the first objection, they would have to dismiss the case. As to the second, the Inspectors had been chosen by the ratepayers, and it was in their power to erect lamps, and it was not likely that they were going to take gas half a mile out of the town for one house. As to the third, they knew the impossibility of getting a rate for the exact amount required. As to the fourth, it was absurd to propose such a thing as an adjournment for four months in the darkest part of the year, and the Chairman was quite right in refusing to put it to the meeting.

#### WEYMOUTH POLICE COURT.—FRIDAY, JAN. 4.

(Before Dr. DREW.)

##### CONVICTION FOR NEGLECTING WORK.

Charles Berry, late a stoker in the employ of the Weymouth Gas Company, was summoned for damage sustained by reason of defendant absenting himself from the employ of the Gas Company, whereby they had sustained damage to the amount of £55.

Mr. Stone, the Company's Manager, stated he gave orders, it being Christmas time, that the stokers should each have a day's holiday in turn. Defendant's holiday was given him on Wednesday, the 26th of December, and he should have been at work the following day. He did not return until Saturday, when he (Mr. Stone) refused to take him on to work again, as he had been compelled to engage another man in his place. Owing to the absence of defendant there was a shorter supply of gas than usual; in about 24 hours 20,000 cubic feet were really lost. The pressure had to be lowered considerably, and he had to light a new bench of retorts to keep up the supply. The loss to the Company was really about £20 on account of defendant absenting himself from work.

Defendant pleaded that he had had a glass too much during his holiday, and was in such a state as not to be able to go to work.

The Magistrate said, if the other stokers had followed the example of the defendant, the town would have been left in darkness, and he was not surprised the manager pressed this case. Defendant would be fined £2 and costs, which he would be allowed a month to pay in.

Defendant said he had no means of paying, as he was now out of work. He was informed that, in default of his paying the money at the expiration of the time allowed, he would be sent to gaol for 28 days hard labour.

### Miscellaneous News.

#### METROPOLIS GAS SUPPLY.

##### METROPOLITAN BOARD OF WORKS.

At the Meeting of the Board on Friday last—Sir J. Hogg in the chair,

A letter was read from The Gaslight and Coke Company, referring to the return of the Board's Gas Examiner, which reported that the gas tested at Graham Road testing station on the 11th of December was only 14·7 candles, stating their inability to account for the deficiency in the illuminating power, and requesting the Board, for the reason stated, not to proceed for the statutory fine. The deficiency was rather more than one candle, and it was pointed out that for seven years there was not one instance of a fine imposed, showing how uniformly and well the Company had performed their duties. The letter from the Gas Company arose out of a report presented at the last sitting of the Board by the Special Purposes and Sanitary Committee, stating that the gas supplied by the Company from their Shoreditch station on the 11th ult. was reported by the Board's Examiner to have been deficient in illuminating power to the extent of 1·3 candles, and recommending that, unless the Chief Gas Examiner certified that the defect was occasioned by unavoidable cause or accident, application be made to a magistrate for his warrant of distress on the Company to the amount of the forfeiture for which they were liable. It having been moved that a reply be sent to the Company intimating that the Board saw no reason for complying with their request, and that it was intended to proceed for the penalty,

An amendment was moved by Mr. Jones to the effect that the Board should not take any further steps in the prosecution. He said that, from practical experience, he knew, as a fact, that the Company supplied gas of an illuminating power equal to over 17 candles, which was more than one candle in excess of the parliamentary requirement. Looking, therefore, at the fact that, as a rule, the consumers got more than value for their money, and that this case of deficient illuminating power was so very exceptional an occurrence, he thought the Board might with a very good grace retire from the prosecution.

Mr. Legg seconded the amendment.

Mr. Rogers said the testing of gas in the Metropolis was a farce, and any fine inflicted upon the Company came out of the consumers' pockets, so that he did not see the good of taking these proceedings. At the same time he should vote for the motion.

Mr. Runtz supported the amendment, remarking that, in consequence of recent amalgamations of smaller undertakings with the Chartered Company, intercommunications had been effected between many of the different mains, and he had no doubt that this deficiency of illuminating power, on the occasion complained of, had resulted from the atmospheric air getting into the pipes while junctions were being made. Under these circumstances, he thought the Board had done their duty, and that they might now very fairly let the matter drop.

After some further conversation the amendment was negatived and the motion adopted.



**CHELSEA VESTRY.**—At the meeting of the Vestry on the 1st inst., Dr. Barclay, the Gas Examiner, reported, "The illuminating power of the gas as supplied to this parish has been decidedly low during the past quarter. Taking, as I have continued to do, the burner which was in use for testing the gas when the Company were rendered liable to penalties for supplying gas of which the illuminating power did not reach the minimum of 12 candles, I find on several occasions it fell below this standard. The results altogether are very unsatisfactory, but they could only be remedied by fresh legislation." The report was referred to a Committee to consider, and it was resolved to send a remonstrance to the London Gas Company as to the quality of their gas.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health, on the Composition and Quality of the Metropolitan Waters in December, 1877 :—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by	Nitro- gen.	Ammonia.		Hardness (Clarke's Scale).	
		Organic Matter, &c.	As Ni- trates, &c.	Sal- line.	Or- ganic.	Before Boil- ing.	After Boil- ing.
<i>Thames Water Companies.</i>							
Grand Junction . . . . .	19.20	0.134	0.120	0.000	0.008	12.6	3.7
West Middlesex . . . . .	19.80	0.003	0.135	0.001	0.008	13.2	4.2
Southwark and Vauxhall . . . . .	18.70	0.127	0.135	0.001	0.009	12.1	4.2
Chelsea . . . . .	18.90	0.068	0.135	0.001	0.010	12.6	3.3
Lambeth . . . . .	20.30	0.083	0.120	0.001	0.009	13.7	3.7
<i>Other Companies.</i>							
Kent . . . . .	27.90	0.003	0.310	0.000	0.003	18.6	6.0
New River . . . . .	20.20	0.036	0.150	0.000	0.007	14.3	3.3
East London . . . . .	14.90	0.036	0.096	0.001	0.007	9.0	3.7

*Note.*—The amount of oxygen required to oxidize the organic matter, nitrates, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, Grand Junction.

C. MEYMOTT TIDY, M.B.

EXTENSIONS AT THE PAISLEY CORPORATION GAS-WORKS.  
(FROM OUR OWN CORRESPONDENT.)

On Wednesday, the 12th ult., an important undertaking was inaugurated in connection with the Corporation Gas-Works, Paisley—namely, the completion of a new gasholder of very large size, together with the necessary governor, connections, &c. The ceremony of turning on the gas from the new holder into the town was made the occasion for bringing together a very large gathering of the leading citizens of Paisley, and for giving a most interesting historical sketch of the progress of the gas manufacture and supply in the town for fully half a century. As was fit and proper, the presiding genius on the occasion was Provost Murray. That venerable gas commissioner, who, though over 70 years of age, is still hale and hearty, and one of the most active men in the town over which he is the much-esteemed chief magistrate, occupied a similar position in reference to the gas undertaking of the town fully 32 years ago. He is a sort of perpetual Provost of Paisley, and none of his fellow-townsmen is more familiar with the subject in question, or takes a keener interest in it. Without entering at present into the details of a comparison of this new gasholder with the holders throughout Scotland, we may mention that only in Glasgow and Leith are there any of larger dimensions.

Provost MURRAY, addressing the large assemblage of gentlemen present, desired, before turning the valves so as to permit the gas to pass into the town, to congratulate his co-trustees, the gas consumers, and the public generally on the successful completion of the important undertaking—a work that had occupied their attention for the past twelve months. The large increase that had taken place in the consumption of gas within the last few years, and the steadily increasing requirements of the community, had forced on the consideration of the trustees the necessity of providing increased storage. A very short statement would suffice to show that they could not have longer delayed the work which had just been accomplished without incurring serious responsibility; and he would simply premise by mentioning that the rule which had now obtained universal sanction, especially for manufacturing towns, was that the storage should range from a day to a day and a half's sale or consumption. The last gas-holder erected at the works was completed in 1862, prior to which the annual consumption was 67 million cubic feet, the greatest daily sale being 390,000 cubic feet, and the storage 262,000 cubic feet, or 35 per cent. less than one day's sale. After the erection of that gasholder, the storage was increased to 1½ day's sale, or 15 per cent. in excess of the highest daily consumption. The consumption last year was 125 million cubic feet, and for the present year it was estimated to reach 132,000,000 cubic feet, the daily sale having reached 800,000 cubic feet, or fully double since the erection of the last gasholder. The storage before the new holder was completed was 475,000 cubic feet, or about 44½ per cent. less than one day's sale—in other words, there was little more storage than for one-half day's sale, a state of matters anything but safe in a manufacturing town, owing to the possible momentary interruption of the process of gas manufacture. Now, however, by the completion of the new holder, the storage was increased to fully 1 million cubic feet, more than doubled, or 17½ per cent. in excess of the highest daily sale. In the end of 1876 instructions were given for the preparation of the necessary plans and specifications for the increased storage power resolved upon by the trustees. They were designed and prepared, and the superintendence of the undertaking was conducted, by their own engineer and manager, Mr. George R. Hislop, without any outside professional assistance, and the result was such as to reflect the highest credit on that gentleman's skill and ability. Tenders for the work were opened on Feb. 1, 1877, and ground was broken on the 14th of February, and the tank Messrs. William Brodie and Co., Paisley, for the holder, columns, girder, was completed in five months, or only two weeks beyond the stipulated period. The engineers began on the 13th of July, and were finished with the holder on the 22nd of November, since which date they had been engaged on the governor, connections, and other minor works. Considering the extraordinarily unfavourable weather of the past season, it was surprising that the whole work had been accomplished in so short a time. It was most satisfactory that it had been executed in a substantial and tradesmanlike manner, and to the entire satisfaction of the engineer. The trustees had received from the hands of the contractors a first-rate job, and he (the Provost) had heard that opinion confirmed by neutral tradesmen. He then gave a brief description of the works, saying the columns, 16 in number, which formed a prominent feature, were executed in the Tuscan order of architecture, and were bound together at the top with an ornamental lattice girder 30 inches deep. In order to prevent accidents to the workmen, when engaged in painting the crown of the holder, or removing snow from it, a protection rail had been placed round the outer

edge of the holder of the same architectural order as the columns and girders—the first example of such an arrangement in Scotch gas-works. The same architectural design had been carried out in the governor in the adjoining building. It might be interesting to notice the quantity of iron used in the construction of the works under consideration:—Columns, &c., of cast iron, 300 tons; governor and minor works, 50 tons; plate and wrought iron in the holder, 176 tons—total, 526 tons. The following were given as the dimensions of the gasholder:—Outer lift, 130 feet in diameter; inner lift, 128 feet; depth of each lift, 25 feet; so that the cubic contents amounted to 675,000 cubic feet; the available storage capacity being 640,000 cubic feet. After some further remarks, Provost Murray said it was a pleasing reflection that so extensive a work, extending over ten months, of a dangerous nature, and carried on under most unfavourable weather, had been completed without loss of life, only two accidents having occurred during the course of the work, neither of which had left any serious consequences.

The Provost then proceeded to turn on the gas, under the direction of Mr. Hislop, and, after three hearty cheers from the company, and a fervently expressed wish for the future success of the work, his worship invited the party to partake of luncheon in the retort-house, which had been specially fitted up for the occasion, and had undergone a transformation scene as magical as any pantomime can show during this festive season. Nearly 120 gentlemen sat down to the bountiful and handsome luncheon. Provost Murray occupied the chair, and was supported on the right by Colonel Holmes, M.P.; and the two croupiers were Bailies McGown and Eaglesim. At the one end of the retort-house there was a very conspicuous gas illumination, bearing the appropriate motto—"Ex Fumo Dare Lucem." After one or two toasts had been pledged,

Mr. HOLMS rose and said that although there was no formal list of toasts, yet there was one which he would venture to propose on the occasion, and which he was sure would be received with the greatest enthusiasm. It was that of "The Corporation Gas Trust." The provost, magistrates, and town council, under various names, performed varied and honourable duties. They were Burgh Governors and Dispensers of Justice, Water Commissioners, Gas Commissioners, and Police Commissioners; and he had never proposed their health on any former occasion with greater pleasure, because as Gas Commissioners they had given a fresh proof of their intelligent enterprise, and their appreciation of the wants of the community. Such an occasion naturally led them to think of the past, and to look back 30 years and note what a change had occurred. Thirty years ago the very name of Paisley was almost synonymous with distress. The amount of income with which the authorities had to intrmit was something like £3000; now it was over £60,000. He thought there could scarcely be a better proof of the progress of the town than the demand for an increased supply of gas. It indicated either that the town was extending or that the existing houses were better lit. During the last 15 years the consumption had actually doubled. After noticing the work and progress of the Water Trust, and referring to the control of the turnpike roads within the burgh, he said it was extremely desirable that the local authority of every large community should have under its own control the three essentials for progress—water, light, and good roads; and he availed himself of the opportunity to show how fully he appreciated a good supply of gas, by saying that when Sir Windham Anstruther brought in his Bill giving power to acquire gas-works all over Scotland, he (Mr. Holms) put his name to the back of it; and the Bill had since been successfully carried through Parliament.

Provost MURRAY, after thanking Mr. Holms and the company on behalf of himself and his colleagues, proceeded to remark that gas lighting, or rather its application to public use, was comparatively a modern invention. Many of those present would, he knew, recollect when their own old town, and all the towns of Scotland, were lighted with oil lamps. He was himself old enough to recollect with what curiosity, when a young man, he went to see a shop lighted with gas in Moss Street; and even yet he could go to the window at the head of Dyer's Wynd, where an enterprising merchant had lighted his shop with gas, made in a small gas-works which he had fitted up in his cellar behind. The first lighting of the town of Paisley was done by a joint-stock company, whose Act of Incorporation received the Royal Assent on May 30, 1823. It was interesting, he said, to recall the names of those persons who had the public spirit and enterprise to furnish the town with such a great boon. He then mentioned the names of the first directors of the company, the twelve original directors, only one of whom was now represented in the town by any family. It was rather curious to notice that in the first Act of Parliament the term "gas," or "coal gas," was not used, the description being that "the said company is established for the purpose of producing inflammable air for lighting the said town and Abbey Parish." The original capital of the company was £16,000, raised in £5 shares. In course of time it became necessary to extend the works, and in 1832 a new Act was obtained, authorizing the creation of a second and third stock, each of £16,000. Only one-half of the third stock had been called up when, in 1844, an occurrence took place which arrested the further creation of stock, and, in other respects, totally changed the management of the works. It was then that the interference of the corporation in gas matters commenced. A clever and energetic parliamentary solicitor, who had, in the previous session of Parliament, been successful in carrying the Act for establishing the City and Suburban Gas Company in Glasgow, contrived to start, in 1844, no fewer than four new gas companies in Scotland—in Aberdeen, Perth, Greenock, and Paisley. In the cases of Aberdeen and Perth new Acts were obtained, and new works were erected, but in the case of Greenock the Bill was withdrawn, because the works in that town were practically held for the corporation, while in the case of Paisley the new company were ultimately defeated in the House of Lords after a severe and expensive parliamentary contest, on the strength of an arrangement by which the old works were to be ceded to the public and managed on their behalf by a joint board of shareholders and trustees named by the town council. The interference of that body in gas matters originated in this way: The new company applied to the town council for leave to open streets and proceed with the proposed new works without an Act of Parliament, on the faith of a promise to supply cheaper and better gas, and on the alleged ground that the old company had threatened to give opposition in Parliament. The town council were of opinion that there was no room for a new company, the existing works being quite sufficient to meet all the wants of the community for a long time to come. While they felt that they could not well interfere between two companies competing for public favour, they saw that there was great danger that the public might ultimately be called upon to pay a return on a double capital, and they sought to impose the following conditions upon the new company in the event of granting permission to open streets—1. That the company should restrict their dividends to 5 per cent. interest, and 1 per cent. for a sinking-fund. 2. That the company should amalgamate with, or sell their works to the old company without first offering them to the town council at a price to be fixed by arbitration. To these terms the company would not agree. While this was the attitude of the town council to the new company, they represented to the old company that the only ground on which they could oppose the new company was that the old company should consent to accept of a



reduced dividend, and cede their works to a public trust for the behoof of the town's people. The controversy which ensued divided the community, and many of the audience would doubtless recollect the "gas question," as it was then called, and how it became really a "burning question," and led to a state of excitement which had never since been paralleled in bitterness by any controversy, political or otherwise. He (Provost Murray) had never seen any reason to question the soundness of the policy adopted by the town council at that time. The best proof of its soundness was to be found in the fact that the two rival companies in Aberdeen, after competing for a year or two, got tired, and agreed to amalgamate, when the consumers had to pay an enhanced price for their gas in order to provide interest on two capitals. It was also found in the fact that not only had all the large towns in Scotland followed the example of Paisley, and acquired the gas-works,\* but that, two sessions ago, Parliament had even passed a general measure to enable corporations to become owners of gas-works, and to supply gas, without the necessity for private Bills. Returning, however, to the subject of the Paisley gas supply, he said that the new company, after having carried their Bill in the House of Commons, were defeated in the House of Lords; and the temporary joint trust which was created by the agreement of 1845 continued for 25 years, and wrought well for the public interest. In 1869 it was felt that so much of the original stock of the gas company had been redeemed, that such an extension of the works had been made by the public, and that the interest of the shareholders in the undertaking had become so small that it was felt to be wrong in principle that private shareholders should possess so much control over a public trust; and, accordingly, a new Act was obtained whereby the works were transferred entirely to the management of the town council. The Provost next gave a short *résumé* of the progress of the works, comparing the condition of things in 1845, when the company ceased, with that in 1870, when the exclusive management of the town council began, as also with the condition now attained:—

Year.	Coals Carbonized. Tons.	Gas Produced. Cubic Feet.	Storage. Cubic Feet.
1845	4,411	40,411,700	190,000
1870	9,259	86,018,000	475,000
1877	13,700	127,000,000	1,000,000

Year.	Gas. £s.	Residual Products. £s.
1845	£8,606	£192
1870	13,902	1762
1877	22,600	2809

In 1845 the original capital had reached to £40,000, and the redemption price of £8 per £5 share was £64,000. Of that original capital there had been redeemed £15,943 at a cost of £24,056, and the amount in the sinking-fund for redemption was £2601. During the 32 years that had elapsed since the works passed from the hands of the gas company, not less than £37,723 had been expended on new works. Those large sums for redemption and extensions had been mainly paid out of surplus profits, while the gas had been sold as cheap as, and frequently cheaper than, in any of the other large towns in Scotland. In conclusion, Provost Murray said that the ground owned by the Gas Commissioners had now all been occupied by the extensions of the works, and that it had been the subject of considerable anxiety to the trustees for some time how they were to provide for future extensions; but he was happy to announce that within the last few days they had secured four acres of ground to the east of the works which would afford ample room to provide extensions for the next 50 or 100 years.

Bailie McGown, in proposing the toast of "The Contractors," said that the Provost spoke so well and so fully as to render speaking on the part of his Bailies almost unnecessary. In choosing contractors for the work, the trustees had to satisfy themselves of their business reputation. They found that Messrs. Adam Bros. and Messrs. Brodie and Co. were fitted to execute the work which they had undertaken, and the opinion of practical men was that the trustees had got a good job. He hoped that coming years would show that opinion to be well founded, and that the job would turn out satisfactorily.

Mr. Brodie replied in an excellent speech. He was greatly pleased at the cordial manner in which the toast had been received. He had been very anxious to secure the contract, especially as he was a native of the town. As to the holder, he did not require to say anything in its favour; it could speak for itself. The Provost, of course, had gone into such a complete history of gas lighting that nothing was left for him to say. There was one point, however, which was not taken up by him, and which he might refer to. He (the Provost) had said that gas lighting was a modern thing; but it had become a very important thing, and it was to the credit of Scotchmen that they were the first introducers of it on an extensive scale. He more especially referred to the labours of Mr. Murdoch, manager of the world-wide famed firm of Boulton and Watt. About half a century ago the people had very erroneous notions about gas. No doubt that was owing to the ignorance of the people; they did not know how to use it properly. But they were advancing. The Royal Society, with Sir Joseph Banks as president, sent a deputation to the House of Commons to petition the Government to restrict the capacity of gasholders, or restrict the contractors from building too large holders. The maximum size at that time was 6000 feet; now they had one in Paisley capable of holding easily 640,000 feet, and which was 107 times larger than the restricted size. With reference to the work, he said they would have been done with it a month or six weeks before their time, but for the unfavourable season, which had been the worst during the last 45 years for doing outdoor work. Without being egotistical at all, he must say that he was a sort of judge of such work. He had done work which had gone to Canada, Sweden, the East Indies, Austria, and Italy. He had been over England and Scotland (and Ireland, as far as Cork), and he could tell them that, in all his travels, he had never seen anything to equal the architectural beauty of the holder just inaugurated, which reflected the highest credit on their engineer, Mr. Hislop. That gentleman was well known, and occupied a high position in the gas world; but he had added a laurel to his name by that architecture. As regarded the proportions of the new holder, he must say they were not too heavy, while everything was able to do its work properly. There was a great difference in the new holder from those that were made fifty years ago. Then the builders made them like boilers; they were afraid of the explosive force, and of course made them four times stronger than they needed to be. There was not only material wasted, but the additional weight had to be counterbalanced. Mr. Hislop, however, had constructed his holder so that there was no superfluous weight in it. It managed to give the maximum pressure, but nothing more. It was self-acting, and required no compensation weights. But that result was not attained at the expense of the substantial article, for, with ordinary care, it would last half a century at least; nay, more, he believed it would last a century if well taken care of.

Mr. W. Adam also replied, and said that, though his brother and he

\* Provost Murray seems not to know that the gas supply of Edinburgh and Leith is still in the hands of private companies.

hailed from Callander, they were both Paisley men. They always felt pride in claiming Paisley as their native place, the birthplace of many illustrious men.

Bailie EAGLESIM proposed the toast of "The Manager of the Gas-Works." He spoke of that gentleman's qualifications as being so highly appreciated not only in Paisley, but throughout the whole country, that there was no need to say a single word. His appointment to Paisley by the late Provost Philips had been a matter of great consideration, but the high opinion then entertained of him had been more than realized; and it was known that he had stood at the very head of the Gas Managers Association.

Mr. HISLOR replied in suitable terms.

Several other toasts followed, including that of "The Old Servants of the Gas Company," proposed by Mr. David Semple, F.S.A. (who recollected well the cutting, in 1824, of the first sod out of the field in which the works were situated), and replied to by Mr. Nairn, the manager of the original gas company.

## IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The past week has been, to a great extent, almost wholly of a holiday character, in part owing to the prolonged nature of the usual Christmas vacation, and partly by reason of the fact that at many of the large concerns the interval is now being made use of for the purpose of taking stock—a proceeding which is no light matter at the larger works. The inauguration of the new year appears to have been the signal for the springing up of a very general agitation on the wages question, and the course of things is now so much altered that the employers are completely masters of the situation, no matter how much the men may threaten all sorts of resistance. At the great Atlas and Cyclops establishments of John Brown and Co., and Charles Cannell and Co., for instance, the puddlers have agreed to accept a general reduction of 6d. per ton, and the shinglers a drop of 5 per cent. At the Milton and Elsecar works of Messrs. G. and W. H. Dawes, the ironworkers have turned out on strike against a proposed reduction of 5 per cent., and at Rotherham the puddlers of the Northfield Iron Company (who are now likely to resume their operations) object to the acceptance of 7½ per cent. under former prices, by agreeing to which reduced rate they can alone obtain renewed employment. In both these cases, however, the masters are almost certain to triumph, as are the other employers who are about to adopt a similar course of action.

The business of the week in all kinds of iron has been meagre, and there appears to be every probability of a weak state of trade for some time henceforward, unless something definite should be almost immediately made known on the Eastern Question. There is abundance of pig iron to be had, and prices are purely nominal in all directions. The same observation applies to the finished and manufactured iron trades.

There is also a plentiful supply of all descriptions of coal and coke, and prices continue quiet.

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There has been but little doing in either the coal or iron trades of this district during the past week, in consequence of the holidays, many of the forges and collieries being closed up to yesterday (Monday), and at none of them was there much work doing during the whole of last week.

For coal, the demand has been chiefly for the better sorts suitable for house fire purposes, and orders, as a rule, have been supplied out of stock; but this branch of trade continues exceptionally quiet for the time of the year. The requirements for manufacturing classes of fuel have naturally been restricted by the general stoppage of work, and at present there seems to be no prospect of any active demand for either forge coal or engine classes of fuel, as very few of the iron manufacturers have forward orders on hand. The cotton trade of the district is very dull, and the chemical and salt trades, which are usually large consumers of slack, are extremely quiet. Nominally, there is no change in list prices, but there is a good deal of pushing for orders amongst the holders of inferior classes of fuel, and the average quotations at the pit mouth may be given about as under:—Best Wigan Arley (screened), 10s. to 11s. per ton; common ditto, 8s. to 9s.; Pemberton four-feet, 8s. to 8s. 6d.; common Wigan mines, for house fire purposes, 6s. 6d. to 7s.; forge coal, 6s. 6d. to 6s. 6d.; burgie, 4s. 6d. to 5s. 6d.; good ordinary slack, 3s. 6d. to 4s. 6d.; and common ditto, 2s. 6d. to 3s. per ton.

The shipping trade continues extremely dull, and good orders can be placed at very low prices, owing to the keen competition for any business coming into the market.

In the iron trade, buyers generally have been holding back until the close of the holidays, and the result of the quarterly meetings next week is known. Some very low quotations are reported in the market, but there is no business doing upon which to base any reliable quotation as to actual values, and nominally prices may be said to be without change, the principal makers, both in this and outside districts, showing no disposition to give way further, notwithstanding the underselling of speculative merchants and some of the smaller producers.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

Since the close of the holidays, as might have been expected from the state of affairs in the Northumberland Colliery districts, there has been more trade astir amongst the Durham Collieries. A good deal of what is termed second-class gas coals in ordinary times is passing into the market as steam coals, and the result is what was predicted in this column a fortnight ago. Second-class Durham gas coals are becoming stiffer in the market, and there has been a rise in prices of something like 6d. per ton in some cases, but it is not very general. The best qualities of gas coals have likewise come into better demand. Steamers were freighted to load gas coals for Italy last week. There have been inquiries also for steamers to load gas coals for the Irish ports, and it may be simply stated that the best collieries in the gas trade are able to work full time and sell the produce of the pits at the rate of 8s. per ton, less 2½. Under the circumstances of the trade, and with the stoppage of the Northumberland pits, tending to give the Durham coals a temporary advance, there seems little disposition on the part of the Gas Companies to enter upon lengthened contracts for the present. The dispute in the Northumberland steam coal trade was even more embroiled last week than the week before. It seems pretty clear, however, that at the late rates of wages the steam coal owners could only make a loss, and they are now bent upon enforcing the full reduction of 12½ per cent. without delay, or they will keep their pits closed. House coals are in average seasonable demand, but nothing beyond that. Prices range from 12s. to 13s. per ton for best. A fair quality of second-class house coal is sold at from 10s. 6d. to 11s. per ton.

The freight market is very much depressed. Last week business was about nominal. Many seeking steamers are lying in the coal ports unchartered. The quotations for steamers to load coals to London are



4s. 3d., and to Dublin 6s. 9d. per ton; Limerick, £10 10s. for sailing vessels. The condition of the manufacturing trade of the North is simply unchanged. In fact, there is no business worthy of a name. The fears that have prevailed lest England should be forced into the fighting in the East continue to stop all sorts of speculation. Merchants will do nothing but a hand-to-mouth business, and there has not been a more gloomy first week of a new year for a considerable time. Of course, if there were any prospect of peace the state of trade would be entirely changed, and 1878 might turn out as good a year as 1877 has been a bad one. The working classes of the North of England have been subjected to a good deal of destitution, mainly through the falling off of business at the collieries and the little trade that has been done at the iron-works. There is considerably less house-building in the towns upon Tyneside. The market for chemicals is very dull, and there is little inquiry for manufactured iron.

#### TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The Lanark Gas Company have just completed some extensions and improvements of their works, which would have been carried out much earlier had it not been for a want of decision on the part of the Directors as to which of their works should be reconstructed. It was only at the annual meeting held last August that the decision was arrived at to abandon the new works, and make the desired alterations on what were the Old Gas Company's works, and which it had become absolutely necessary to delay no longer, the consumption of gas having increased 35 per cent. from the time that the price was reduced from 8s. 4d. to 5s. per 1000 cubic feet. On the advice of their Manager, Mr. Monk, they resolved to effect a general reconstruction of the works, so as to make them more suitable for the requirements of the town, and render the establishment something like a gas-works. Only the first portion has been completed, consisting of a large new coal-store, doubling the purifying apparatus and condensers, and adding a washer and a new tar-tank, the latter being so arranged that no pumping is required, the tar and liquor gravitating from the hydraulic main to the casks in which they are removed.

At the last meeting of the Town Council of Aberdeen it was resolved, on the recommendation of the Lighting Committee, to supply 200 additional street-lamps with flat-flame burners, making in all 1630 lamps throughout the town thus supplied.

On the evening of Friday week the tenth annual festival of the workmen employed by the Dundee Gas Commissioners was held—Mr. McCrae, Manager, in the chair. The company numbered upwards of 300, and included some of the Commissioners. Several suitable and very interesting addresses were delivered by the Chairman and other gentlemen. Mr. McCrae said they had never made so much gas in any previous year; never had they been able to supply the town of Dundee so well, and it was a very pleasing thing to know that there had never been so few people complaining.

The Dundee Gas Commissioners held their usual monthly meeting last Wednesday, at which it was resolved to borrow an additional £10,000 under the powers contained in the Dundee Gas (Additional Powers) Act, 1877; and it was reported that the sum of £9735 had been received in loan from 86 depositors. Mr. McCrae submitted a most interesting report upon the new system of lighting street gas-lamps by electricity, which he concluded by saying that, in the meantime, he could not recommend the adoption of the new mode of lighting; however, it would be further investigated into, and seen in operation where it had been introduced.

A considerable amount of excitement is still being manifested in the town of North Berwick, regarding the late proposal to adopt the Burghs (Scotland) Gas Supply Act and the withdrawal of the same. There is a discussion in progress on the question as to when the proposal can again be brought forward officially—at the end of the present year, or not till the lapse of three years.

The annual meeting of the Macduff Gas Company was held on the 26th ult.—Provost Martin in the chair. After the approval of the balance-sheet and the report for the year ending the 20th of December, and the election of the Committee of Management, a dividend of 5 per cent. was declared on the past year's profits.

Business was done on the 2nd inst. in Glasgow Corporation 6½ per cent. Gas Annuities, at the former quotation of 159½.

In no instance did the official returns on the quality of the Glasgow gas for the week ending the 29th ult. show a lower minimum than 25·80 candles, while the maximum illuminating power ranged from 26·77 candles to 28·57 candles, and yet the consumers will complain of the quality of the gas which they are getting, if we may judge by talk at the Town Council meeting held last Thursday.

Stimulated by the action of the Southborough Local Board, on the question of lighting the street-lamps with oil instead of gas, some of the Ardrossan and Saltcoats gas consumers are becoming loud in their complaints at the quality and cost of the gas supplied to them, and urging that oil should be tried, while sighing a little longer for the coming electric light.

During the last ten days or so there has been practically very little doing in pig iron and coal, in consequence of the Christmas and New Year holidays. Both commodities have remained almost stationary in price, and it would seem as if the price of pig iron were destined not to go below 51s. 6d. cash per ton.

**FUEL AT ODESSA.**—It is reported that fuel has become so dear at Odessa that the Water-Works Company have been obliged to stop their engines. This example has been followed by the Gas Company and several other factories.

**WOKINGHAM WATER SUPPLY.**—A new company, called the Wokingham District Water Company, was registered under the Joint-Stock Companies Act on the 20th ult., with a capital of £20,000, in £10 shares, for the purpose of supplying water to the town and parish of Wokingham, and the parishes of Binfield, Warfield, Easthampstead, Sandhurst, and Fitch-hampstead, and other places in the county of Berks.

**ILLUMINATION OF THE TAY BRIDGE.**—On the evening of Saturday, the 22nd of December, a series of gas-lamps which have been erected upon the high girders of the Tay Bridge were lighted for the first time, and the effect was very fine. The bridge would certainly have a splendid appearance if illuminated across the whole way in the same manner. It is stated that the lighting is subject to the orders of the Board of Trade authorities, who have now to consider how the navigation of the river is affected.

**PATELEY BRIDGE WATER SUPPLY.**—At a recent meeting of the rate-payers of Pateley Bridge it was unanimously resolved that, in recognition of the action to be taken by the Rural Sanitary Authority for providing a pure and sufficient supply of water for domestic purposes for the town, such Sanitary Authority be requested to take the necessary steps for constituting the town and neighbourhood a separate contributory place, in which specified area there shall be a uniform rate in the pound paid for domestic consumption, and a fixed charge per 1000 gallons agreed upon for business premises and purposes.

**WATER SERVICE OF ST. LOUIS.**—The Mississippi water supplied to St. Louis is abundant in quantity and wholesome in quality, but in colour it is suggestive of weak coffee without milk. To the stranger it is a surprise, not altogether pleasant, and to wash or bathe in it or drink it requires some courage at first. It is, however, good water, and in many respects much better than that supplied to some other large Western American cities. In summer the daily consumption is about 27 million gallons. As the weather grows colder the average drops down to 20 million gallons per day. All this water comes from the Mississippi.—*Engineering.*

**DARLINGTON CORPORATION GAS SUPPLY.**—At the meeting of the Darlington Town Council, on the 3rd inst., a report was presented by the Gas Manager, which stated that the quantity of gas made in the half year ending the 31st ult., amounted to 55,698,100 cubic feet, as compared with 54,409,100 cubic feet in the corresponding period of the previous year, being an increase of 1,289,000 cubic feet. The coal used during the last half year was 5659 tons 18 cwt., as against 5305 tons 11 cwt. in the second half of 1876, being an increase of 354 tons 7 cwt. The average make of gas per ton of coal for the last half year was 9833 cubic feet, against 10,255 cubic feet in the six months ending Dec. 31, 1876, showing a decrease of 422 cubic feet.

**SINGULAR ACCIDENT THROUGH AN ESCAPE OF GAS.**—An accident of a rather alarming nature took place at Stonehaven some days ago. While Mr. Graham Ross, gas manager, and Mr. James Burness, plumber, were engaged in re-laying a connection of gas-pipes between the main in Allardice Street, and the premises of Messrs. Mowatt and Sons (Carron Tan-Works), the plug got out of the pipe, and a considerable quantity of gas escaped, which, making its way through an aperture in the wall of a leather store, was set on fire by a naked light burning there. The flame very quickly ran along to the pipe from which the gas was escaping, and suddenly burst out on Ross and Burness, scorching them very severely on all exposed places. Fortunately, owing to the prompt manner in which the mouth of the open pipe was plugged with a lump of clay, the fire was quickly extinguished, and serious damage was prevented.

**QUALITY OF THE NEWCASTLE-ON-TYNE GAS.**—Mr. John Pattinson reports the following as the results of his examinations for December of the quality of the gas supplied to the borough by the Newcastle-on-Tyne and Gateshead Gas Company:—

Date, 1877.	Illuminating Power in Sperm Candles.	Grains of Sulphur in 100 Cubic Feet of Gas.	Sulphuretted Hydrogen.
Dec. 4 . . . .	14·4 . . . .	7·11 . . . .	None.
" 7 . . . .	14·6 . . . .	6·17 . . . .	"
" 11 . . . .	14·9 . . . .	7·36 . . . .	"
" 14 . . . .	15·1 . . . .	6·58 . . . .	"
" 18 . . . .	14·9 . . . .	7·41 . . . .	"
" 21 . . . .	15·3 . . . .	8·08 . . . .	"
" 24 . . . .	15·3 . . . .	5·48 . . . .	"
" 28 . . . .	15·3 . . . .	7·27 . . . .	"

A Sugg-Letheby standard Argand burner is used in testing. According to Act of Parliament, the gas should not be of less than 14 standard candles illuminating power, nor contain more than 17 grains of sulphur per 100 cubic feet of gas.

**BURSTING OF A FILTER POND NEAR NEWCASTLE.**—On Monday, the 31st ult., about a quarter past six o'clock in the morning, the wall supporting the south side of one of the Throckley filter-ponds, to the extent of 50 yards, fell in a solid mass. It was fortunate that at the time there was only about fifteen inches of water in the pond, which has an area of nearly 24,000 square feet, but this was sufficient to overflow the ordinary escape for the waste water and washed the main turnpike for a distance of nearly half a mile, to the depth of 2 feet. Happily, the means of escape to the Walbottle Dene and over the sloping banks to the River Tyne was good, and the only damage occurred to a house on the turnpike side, occupied by Mrs. Makepeace, it being flooded to the extent of 1 foot. The ponds have been in the course of erection for the last four years, and are constructed from the plans of the Water Company's Engineer, Mr. T. R. Foster. The foundation consists of rubble stone, about 16 feet in thickness at the bottom, and sloping gradually until at the height of 18 feet it measures 7 feet; this had to support a brick wall 5 feet wide at the bottom, 9 feet high, and 2 feet wide at the top. The foundation has given way; the weight of the upper portion of the wall and the water appears to have torn the rubble asunder, while the brick wall seems to have fallen in a solid mass. The damage will amount to some thousands of pounds.—*Northern Echo.*

**COAL AND ITS COMPONENTS.**—On Wednesday evening last Professor Barff, M.A., delivered the first of a series of "Juvenile Lectures," at the Society of Arts, Adelphi, taking as his subject "Coal, and its Formation." The lecturer described briefly the supposed formation of coal, and showed specimens which proved its vegetable origin; he then proceeded to notice the various kinds of coal, and explained how they differ from one another in composition. The next subject touched upon was the method by which chemists determine the composition of complex bodies. A brief description was given of what is called proximate analysis; and, in illustration of this, an experiment was performed, which consisted of heating some fragments of coal in a hard glass tube. The products of the decomposition being passed through various receivers, the results produced showed water and coal tar in the first receiver, and in the second the blackening of acetate of lead solution proved the formation of sulphuretted hydrogen by the destructive action to which the coal had been submitted, thereby showing the presence of sulphur in coal. The gases which issued from the delivery-tube were burnt. He next explained what was meant by ultimate analysis, and illustrated this experimentally by burning a piece of coal in a hard glass tube, and leading, by means of an aspirator, the products of combustion first through a condenser and then through a solution of lime in water; in the first vessel water was condensed, and in the second the lime water became turbid, showing the formation of carbonic acid gas. Towards the end of this experiment pure oxygen gas was passed through the tube containing the hot coal, and the action became much more vigorous; and this afforded a place for an explanation of the work which oxygen performs in nature. The general properties of carbon were next explained, and its occurrence in nature in different forms mentioned. The general tests for carbonic acid gas were shown; how it always extinguishes a light, and its action on lime water, rendering it milky by the formation of chalk, or carbonate of lime. The existence of carbon in organic matters was shown by acting on a strong solution of sugar by concentrated oil of vitriol, the sugar being decomposed and abundance of carbon being set free, which frothed up and filled the large glass vessel in which the experiment was performed. It was also shown that carbonic acid is breathed out by animals. After this portion of the lecture was concluded, a series of experiments were performed by Mr. Orchard, of High Street, Kensington. This gentleman is largely engaged in condensing gases, especially nitrous oxide, or laughing gas, which is used in "painless dentistry." Professor Barff explained how it is that gases can be brought into the liquid condition, and the experiments of Mr. Orchard illustrated this explanation. They consisted first in allowing the escape of liquid carbonic acid from a strong iron vessel, the escaping



gas being tested by lime water to prove that it was carbonic acid, it was then allowed to rush out in a long stream, which from its whiteness was clearly visible, next it was allowed to rush into a metal receiver, and when the receiver was opened a ball of solid carbonic acid was turned out, which looked exactly like a snowball. Some of this solid was put into a test-tube, and the gas, slowly escaping, extinguished a lighted taper. Mercury was also frozen by a mixture of solid carbonic acid and ether; and the lecture concluded with some experiments with liquid laughing gas, which was exhibited to show a gas in the liquid state, for it is difficult to show carbonic acid in this condition in the lecture-room. The second of this series of lectures will be delivered to-morrow evening, and will treat of hydrogen and some hydrogen compounds obtained from the destructive distillation of coal.

## Register of New Patents.

2526.—GOEDICKE, F. W. E. R., Stratford, Essex, "Improvements in the means and apparatus for the effectual and profitable disposal of sewage, without pollution of rivers and watercourses, and without any alteration of the usual water-closet and drainage system." Provisional protection only obtained. Dated June 19, 1876.

This invention has for its object the distribution of sewage, either for the fertilization and irrigation of land, or for the manufacture of manures and chemicals, and consists of improvements in conveyance of the by-water carriage-way collected sewage by the operation of its own water, without or after disinfection, from one or several outfalls, to localities for the use of farmers and others, by means of one or several pumps varying in construction according to circumstances, to force the sewage through pipes, covered channels, or sewers, into cisterns or tanks fixed in the different localities for final utilization. Each cistern is parted off in one or more compartments by perforated partitions, or two or more tanks are connected by strainers or sieves, thus separating the solids from the liquids. The solids are carted away, the liquids go directly on to the land by perforated pipes or otherwise, or are distributed by water-carts. On suitable outfalls or localities, the sewage is cleared at once, by a strainer or otherwise, from the solids to be carted away, and the liquids to be distributed by pipes to the land or chemical works; or, where required, the solids and liquids might conjointly, by the same operation, be at once distributed in an unseparated condition for the utilization of land.

2527.—HAZLEHURST, G. S., Runcorn, "Improvements in and apparatus for pumping liquids, and pumping and condensing gases, such apparatus being also applicable for use as a blowing or exhausting engine." Patent dated June 19, 1876.

The principle embodied in this invention consists in the gas or air being set in motion or pumped, by causing columns of liquid to intermittently change their level by the action of steam or air pressure supplied through a suitable slide or other valve. The apparatus consists of two suitably shaped tubes or vessels joined together at the bases, and partially filled with liquid; steam or other pressure is intermittently applied to the liquid in vessel No. 1, thus causing the liquid to change its level and rise and fall in vessel No. 2. The pressure may be applied intermittently to vessel No. 1 through a slide-valve, or by other suitable means. Vessel No. 2 is provided with suitable valves, so that as the liquid rises and falls fresh liquid, gas, or air is drawn in and then discharged in any required direction. At or near the bases of the vessels are seatings, on which the floats at the extremity of the stroke may rest, thus forming a joint, and preventing the liquor being forced too far.

2539.—BECK, W. H., Cannon Street, London, "Improvements in furnaces for the manufacture of gas and for other purposes." Provisional protection only obtained. Dated June 19, 1876.

This invention relates especially to furnaces used in the manufacture of gas, but is also applicable to furnaces in general, especially those in which a high heat is required to be uniformly kept up, or which are required to be replenished at short intervals, or to be kept open a considerable length of time for cleaning out and clinking.

Whenever, as is usually the case, a flue or chimney is used in connection with a furnace, the rush of cold air which necessarily takes place as soon as the furnace door is opened produces a sudden lowering of the heat, with consequent waste of fuel and other disadvantages. The object of this invention is to avoid this difficulty, and to this end the furnace door is connected with the damper in the chimney or flue in such manner that the opening of the door closes automatically the damper, thus shutting off the draught, and effectually preventing any cold air from entering the furnace while the door remains open. On the other hand, the closing of the door re-opens automatically the damper, in which event the normal draught of the furnace is resumed.

It is in this automatic operation of the draught-regulating damper that this invention is comprised, and any suitable mechanical arrangements may be employed for connecting the door to the damper. One arrangement consists in fixing to the door the axis or rod which holds the eyes on the door to the stationary eyes on the door frame so as to turn with it. This axis or rod is prolonged so as to extend above the top of the furnace, and carries on its upper end a crank-arm provided with a wrist-pin, on which is hung one end of a connecting-rod, the other end of which is attached to the sliding damper. The crank is fixed on the axis or rod in such a position that when the door is closed the crank will be turned so as to retract or draw out the damper from the flue or chimney opening, while when the door is opened the crank will be turned so as to move the damper to the full extent in the direction requisite to close the flue or chimney.

2550.—LAKE, W. R., Southampton Buildings, London, "Improvements in adjusting wrenches or spanners." A communication. Provisional protection only obtained. Dated June 20, 1876.

This invention relates to a wrench in which the jaws are permitted to yield when the handle is returned to its first position, in order to slide over the corners or angles of the article to which it is applied preparatory to re-engagement with another side or face thereof. It also comprises an adjustable jaw in combination with a jaw fitted to a sliding bar, whereby the jaws may be adjusted relatively to the thickness of the nut or other article to be grasped, and the sliding bar will be engaged by a controlling lever always at the same shoulder or notch, regardless of the thickness of the article. It further comprises a manner of applying the head or journal of the adjusting screw to the supporting step; also the construction of the hollow handle of the wrench. The moveable jaw is adjustable relatively to the fixed jaw by means of a screw fitted to the shank of the moveable jaw, and swivelled to a step or stirrup which occupies a position at the upper end of the handle.

2583.—WILSON, R., and LEACH, W., Accrington, "Improvements in ejectors or apparatus for raising and forcing liquids." Provisional protection only obtained. Dated June 23, 1876.

The object of this invention is the construction of a simple form of ejector or apparatus for raising and forcing liquids, and consists in dispensing with the suction-pipe in such apparatus, and admitting the steam

in a direct line with the discharge-pipe. This is accomplished by having the inlet for the liquid arranged in the form of holes surrounding the casing of the apparatus, which is immersed bodily in the liquid required to be raised; such holes thus not only form a strainer for the liquid being raised, but the working of the apparatus is less liable to be affected by the temperature of the liquid.

2591.—REDWOOD, T. B., North Finchley, London, "Improvements in the manufacture of gas for burning." Patent dated June 23, 1876. This invention relates to the following modifications in the method of applying a process for the manufacture of gas from coal, for which a patent was granted to the present inventor in 1875 (No. 2685).

Instead of conveying the gas immediately as it issues from the retort through the converting chamber or converter, it is made to pass through the hydraulic main before entering the converter, and in this way the gas produced in several retorts may be conveyed through one and the same converter. By this means also the gas before entering the converter will be deprived of much of the solid and liquid particles which it carries from the retort, and which are deposited in the hydraulic main in the form of tar. It is desirable to exclude as far as possible the less volatile part of the tar and all solid particles of carbon and dust from the converter, as these, if deposited on the surface of the copper in the converter will prevent it from exerting its peculiar and required action on the gas.

It is advantageous and, in working with large volumes of gas which pass quickly through the hydraulic main, it is important to adopt some method by which the solid and less volatile particles still retained in suspension may be removed by a sort of process of filtration or separation after the gas leaves the hydraulic main and before it enters the converter. This may be effected by the use of Pelouze and Audouin's mechanical condenser, or by causing the gas to pass through a cylinder with projecting longitudinal ribs on its inner surface, and a fan rotating with great velocity in the axis of the cylinder, so as to cause suspended liquid and solid particles to be aggregated by concussion.

This mechanical purification of the gas should be effected without cooling it, and while it is still at or near to the temperature at which it passes through the hydraulic main. It may even be sometimes advantageous to increase the temperature by means of a steam-pipe or otherwise, because, with a view to the production of some of the effects contemplated in the use of the converter, it is necessary to retain as much as possible of the more volatile hydrocarbons which are present in crude coal gas, and which, in contact with the red-hot copper in the converter, are transformed into permanent gases. To bring the gas into contact with the heated copper in the converter, it is filled, or partly filled, with copper tubes, each about 1 inch or 1½ inch in diameter, and from 18 inches to 3 feet in length. These are closely packed and arranged in such a way that there are two groups or bundles of them, each group filling the internal circumference of the converting chamber or cylinder, while there is a vacant space left between the groups, and the orifices of the separate tubes in the two groups are not exactly opposite each other. The current of gas is thus broken without its being too much obstructed.

The two ends of each converting chamber or cylinder should be closed with moveable lids or doors, which can be easily removed for the purpose of cleaning the copper tubes, so as to remove any solid particles that may accumulate there, and which may be caused by the previous imperfect cleansing of the gas.

It may sometimes be desired to produce and obtain the whole of the tar in the state in which it has hitherto been usually obtained in gas-making, while at the same time the quality of the gas may be improved by depriving it of sulphur in other form than that of sulphuretted hydrogen, and with this view the gas may be carried not only through the hydraulic main, but also through the condensers before it enters the converter. In this case, as the contemplated improvement in the gas will result from the decomposition of bisulphide of carbon, together with water and the production of sulphuretted hydrogen, and as most of the aqueous vapour which the gas carries from the hydraulic main will have been separated by condensation before it reaches the converter, it is desirable to introduce water or its vapour into the converter with the gas. This may be done in any suitable way to the extent of a pint or more of water, or an equivalent quantity of steam, for every 1000 cubic feet of gas. In operating in this way for the purpose of transforming bisulphide of carbon into sulphuretted hydrogen, the converter may be used at a lower temperature than is indicated in patent No. 2635.

It is preferred to operate as follows:—The gas as it comes from the hydraulic main is caused to pass through an apparatus, such as has been described for the removal of solid and previously condensed liquid particles, and then in its still heated state it is conveyed through a heated cylinder or retort lined with copper and packed with copper tubes, as described. By this means the volume of the gas, the inventor says, is increased, and its quality, both as regards illuminating power and freedom from sulphur in other form than that of sulphuretted hydrogen, is at the same time improved.

In cases where it is desired to obtain the whole of the tar in the state in which it has hitherto been usually obtained in gas-making, the gas, after passing in the usual way from the hydraulic main and through the condensers, may be conveyed through the converter, together with the vapour of water for the purpose of reducing the quantity of sulphur in other form than that of sulphuretted hydrogen, and in this case the converter may be kept at a temperature somewhat lower than that of a cherry-red heat. The converter should be heated externally by a fire, by which it can be kept at the required temperature, and the gas after passing through the converter is to be conveyed to the condensers and purifiers in the usual way.

2635.—NEWTON, A. V., Chancery Lane, London, "Improvements in liquid-meters." A communication. Patent dated June 26, 1876.

This invention relates to that description of liquid-meters in which the flow of the liquid is measured by pistons working in cylinders, and operated by a head or pressure, which forces or causes the liquid to be delivered through pipes or otherwise, as required. It consists in a double-cylinder meter, in which each cylinder is furnished with a reciprocating and elongated or double-headed piston, and an intermediate cylindrical valve, operated by the piston, to control passages arranged for the purpose of effecting the reversal of the pistons, which latter and their valves move successively in like directions. The valves are what may be termed floating balanced ones, and the meter is constructed so that there is a free continuous outlet through the valves from the two cylinders, and a constant pressure of the liquid between the two heads of each piston. The liquid under pressure is admitted alternately to the four ends of the cylinders outside of the piston heads, by means of the intermediate valves which move back and forth with the pistons, causing the contained liquid to be forced out of the opposite ends of the cylinders.

The inlet-pipe is situated a little to one side of the longitudinal centre of the one cylinder, and the outlet-pipe to the opposite side of the longitudinal centre of the other cylinder; and in a line with each of these pipes is a passage connecting the two cylinders together. These passages are for admitting liquid from one cylinder to the other, and they are alternately covered by the cylindrical floating valves, which have a



broad annular recess in their outer peripheries forming passages for the flow of the liquid, and are driven alternately to the right and left, by the pressure of their respective piston heads against pins which project from their opposite edges.

On the top of the two cylinders are two cross watercourses or passages, which extend from the middle of one cylinder to the end of the other; and the like arrangement, but the inverse of this, is provided at the bottom of the cylinders. These cross watercourses or passages open at one end into their respective cylinders, at points within the control of the floating valves, and at their other end their parts are near the heads of the cylinders. By this arrangement the liquid supplied under pressure to the meter will fill the space between the cylinder heads, impart a to-and-fro motion to the pistons, and operate the valves so as to allow of a continuous discharge of the liquid.

By providing an indicator, which may be operated by the pressure of one of the piston heads against a lever, the amount of liquid passed through the meter will be ascertained.

2684.—JOHNSON, J. H., Lincoln's Inn Fields, London, "*Improvements in cocks.*" A communication. Provisional protection only obtained. Dated June 29, 1876.

This invention consists in constructing cocks with a stop arranged in such a manner that when the cock is shut the plug is secured and maintained in the position which closes the passage, so that it cannot become opened again accidentally or otherwise than at the will of the operator.

In order to obtain this result a bolt is provided, either on the side of the body or socket, or at the top or at the bottom of the cock, the extremity of which enters the plug automatically when the cock is shut, and prevents any accidental rotation of the plug.

According to one of several modifications, a cylindrical projection or bearing is cast or otherwise affixed to the side of the body of the cock, through which is passed a bolt terminating in a button, and acted on by a spiral spring. When the cock is closed and the hole in the plug is perpendicular to the axis of the cock, the bolt impelled by the spring enters the hole, and thus prevents any rotation of the plug. In order to move the latter it is necessary to liberate voluntarily the bolt with one hand, by pulling the button, and to cause the plug to make a quarter of a revolution with the other hand. The cock is then open, and the plug maintains the bolt drawn back until the moment when in closing the cock the bolt, under the action of the spring, again enters the orifice in the plug.

2691.—ANDERSON, C., Leeds, "*An improved means or apparatus for connecting and disconnecting gas, water, or other pipes.*" Patent dated June 30, 1876.

The object of this invention is to provide apparatus whereby gas, water, and other pipes may be brought together and held in position whilst joints are packed or run with metal; also to disconnect the joints after being made, and by it the breaking of pipes when of disconnecting them is avoided.

For the purpose of connecting two pipes, they are brought in a line with each other, and on each pipe is placed a clamp, as near as convenient to the part forming the joint. These clamps may be tightened on to the pipes by means of suitable wedges, screws, or their equivalents. Each clamp is provided with two screws of suitable pitch, which are placed directly opposite each other—that is to say, opposite each screw on one clamp is provided a screw on the other, and in order to form a connection between the two clamps, nuts are provided, into which the screws are fitted so as to work freely. By giving a rotary motion to the nuts, right or left, the screws are brought towards each other, or further separated, carrying with them the clamps. By this means the pipes are drawn together ready for packing, or drawn asunder and the joints separated. The nuts are caused to revolve by means of any ordinary ratchet arrangement actuated by a suitable lever or levers.

2712.—HENDERSON, A. G., Edinburgh "*Improvements in gas-meters.*" Patent dated July 1, 1876.

The object of this invention is to secure uniform registration independent of the liquid level, and without materially increasing the loss of pressure over that absorbed by the ordinary wheel.

This improved wheel is identical with the ordinary wheel, in so far that it revolves in a chamber, partly filled with water and gas, upon an axis; and in having four hollow chambers, which, fitted in their respective positions, completely surround the axis; and also in that gas and water alternately pass through these hollow chambers as the wheel revolves. Here, however, its identity with the ordinary drum ceases. It has no cover on the front end forming the fifth chamber of the ordinary drum. It has but one fixed central shield of large diameter supporting the four chambers, and which also serves to separate, from the main body of measured gas passing through each chamber, a small portion of gas which is expelled outside the wheel into unmeasured gas contained within the external case of the meter, and from whence it passes through the measuring chamber of the wheel a second time.

The inlets of the chambers as they successively rise out of the water are open to, and each chamber obtains its proper supply of gas (dependent upon the height of the water-line) from that contained within the external case of the meter, and which again is supplied from the mains. As the chamber fills with gas the wheel revolves, and not until the inlet is sealed in water do the outlets (for there are two) discharge the gas contained in the chamber. The gas inlet of each chamber may extend outside and over the wheel, and at the larger end of the chamber from the level of the water in front over the rim and to the level of the water at the back. The gas outlet of the main body of the gas is at the other and smaller end of the chamber, and extends inside from the height of the water level at front over part of the rim of the preceding chamber. The small portion of gas left behind in the chamber travels from the discharge port of the main body of gas a not less distance than an arc of a circle of 45°, or thereabouts, when it is discharged at the second discharge port, which extends over half the breadth of the rim, and over the back of the wheel to the height of the water.

The first discharge port is in communication with the spout, which leads the now measured gas on to the burners. The gas from the second port is discharged at the back of the wheel into unmeasured gas, from whence it passes a second time through the wheel. The water travels through the drum by the same ports as the gas.

Each chamber is made mainly of three pieces—namely, two hoods or sides, and a tapered band of the same metal, which answers to that portion of the rim or cylinder over one chamber of the ordinary drum and the quarter or partition, but differently extended. That portion of the band of metal answering to the rim or cylinder, and to the partition of the ordinary wheel, is extended about half its breadth or more to a suitable length, and their inner edges are soldered to the large central shield supporting the chambers. To a certain extent these chambers outwardly resemble the buckets of an elevator or dredger. The chambers when fitted together into their proper positions around the axis form their own inlets and outlets for the passage of both the water and gas, as well as being the measure.

The wheel has its inlets extended back and front from the surface of the water and across its outer diameter; the gas therefore exerts great

power over the wheel, as it bears constantly on the greatest leverage of the wheel, the action of the wheel is consequently steady. The gas inlets may also be limited to the slits in the hoods, both in front and back, and the periphery of the wheel may then be a continuous band of metal. The outlets are placed within the wheel, and are situated at less than half the radii of the wheel. As the outlets rise out of the water, the measured gas is first discharged by the ports for its passage, which ports rise out of the water on the side where the bent pipe is situated earlier than the ports on the other side of the supporting shield. The bent pipe carries off the gas to the burners. The volume of gas detached from the main body by the shield is discharged into the unmeasured gas chamber.

It will be seen that the gas in passing through each chamber of the wheel divides itself into two portions in a direct and natural manner, the larger portion is discharged measured before reaching the extreme end of the chamber, and from thence it is conveyed through the bent tube (the spout) and on to the burners; the smaller portion travels the entire length of the chamber before it is discharged from the second outlet into the unmeasured gas contained within the external case of the meter. The outlets of each chamber are of equal area and, therefore, when the water-line lowers, an equally larger quantity of gas is discharged at both outlets. The converse holding good, that is to say, when the water-line is raised the quantity of gas discharged from the outlet of the chamber is lessened in equal proportion. There is, therefore, perfect reciprocity with the outlets, hence a fixed volume of gas is discharged to the burners.

The four chambers around the axis of the wheel may be fitted in their positions in different ways. It may be done without bringing the chambers into direct contact one with the other, their relative positions each to each may be made with strips of metal and solder, so that a space from one to four-eighths of an inch, more or less, will intervene between each chamber; or the chambers may come into contact one with the other at different points, and soldered one to the other.

2814.—DAVEY, H., Leeds, "*Improvements in compound pumping-engines.*" Patent dated July 11, 1876.

This invention relates to the construction and arrangement of steam pumping-engines of the compound type—that is to say, having a high-pressure cylinder from which the steam, after performing work therein, passes to a low-pressure cylinder, and performs further work by expansion. The two cylinders are placed side by side, and the piston of each is connected to one arm of a bell-crank lever. The other arms of the two bell-crank levers are connected to one another by a rod, so that the two pistons always move in opposite directions. This enables the steam to pass directly from the one cylinder to the other at the same ends of the cylinders, whereby long passages for the steam are avoided, the valves simplified, and the strain on the foundations diminished. The ports of the cylinders may be governed either by slides or by double-beat or equilibrium valves. When the cylinders are double-acting two slides are employed, one at each end, or six valves, three at each end, governing respectively the supply to the high-pressure cylinder, the exhaust therefrom which supplies the low-pressure cylinder, and the discharge from the latter.

2824.—LINFORD, C., Leicester, "*Improvements in gas-engines, and in appliances connected therewith.*" Patent dated July 11, 1876.

The main feature and object of this invention is the construction of gas and air engines of large size and great power. This is accomplished by the combination of a piston fitted with a balance-weight, in such manner that the dead weight of the piston which has to be lifted by the explosion of gas and air, on the up or out stroke of the piston, in gas and air engines as hitherto constructed, may be reduced to a minimum, or only so much as will overcome the friction of the piston packing on its descent, thereby reducing, a considerable amount, the charge of gas and air necessary for lifting the piston. In connection with and auxiliary to the piston a receiver and air-pumps are employed to empty the cylinder, or nearly so, of the exploded and residual gases during the descent of the piston, thus rendering unnecessary the continued descent of the piston to the bottom of the cylinder, as has been usual hitherto, to expel the exploded gases, at the same time obviating the necessity for raising the piston at the termination of its down stroke previous to the commencement of the up stroke.

2831.—CLARK, A. M., Chancery Lane, London, "*Improvements in water-meters.*" A communication. Patent dated July 11, 1876.

This apparatus consists of a measuring cylinder of cast iron, lined with copper and closed at both ends, in which moves a piston formed of two cupped leathers clamped together by discs screwed on the piston-rod. A copper or other metal valve-casing is attached to one side of the cylinder by means of flanges. A valve-rod with valves for regulating the inflow and the outflow of the water extends from end to end of the casing, and passes up through a stuffing-box, where it is attached to a lever at the upper part of the apparatus. The piston-rod passes up through a stuffing-box, and its upper end, which is provided with friction rollers, is made to oscillate a weight, alternately in opposite directions, for raising or lowering the lever attached to the valve-rod, and thus to shift the position of the inlet and outlet valves. The valves during this movement are caused to press against annular seats, faced with india-rubber, screwed within the valve-casing, for shutting off the supply of water on the one side and opening it on the other, whereby the water is alternately admitted on each side of the piston. One of the friction rollers mounted on the piston-rod is made, on the completion of the downward as well as of the upward movement of the latter, to act upon mechanism for operating a counter to indicate the quantity of water passed through the meter at each stroke of the piston. This mechanism is enclosed in a casing which is provided with a glazed opening for inspecting the dials. A spiral spring arrangement may be employed in lieu of the weight for reversing the valves.

2870.—PRESTON, F. P., PRESTIGE, J. T., and PRESTON, E. J., Deptford, "*Improvements in pumps and their fittings.*" Patent dated July 13, 1876.

The first part of this invention relates to various alterations in the construction of pumps of the description in which two or more pistons or buckets, actuated by a crank, work in one barrel or cylinder, and consists in introducing a friction ring or roller on each of the crank-pins. This ring or roller is cast direct on to the crank-pin after the crank has been properly turned, the friction ring or roller intervening between the crank pin and the slotted cross head to which the crank gives motion. Sometimes instead of casting a friction ring or roller on to each pump crank-pin, it is preferred to cast an ordinary slide block direct on to it, and, in this latter case, the slide block is sometimes fitted with friction rollers.

The second part of the invention relates to the deck or suction-plate ordinarily used with a Downton's three-throw pump, and consists in substituting a modified bayonet joint instead of the ordinary male and female V-threads, thus considerably shortening the time occupied in connecting and disconnecting.

The third part of the invention relates to a sea-cock for inlet at ship's side to pumps and like apparatus, so that a clear straight passage right through is obtained, and without any sunken recess at the bottom of the valve, as is the case in ordinary clear-way valves, which are soon choked



up by seaweed and other like substances filling up the recess. This is accomplished by making one facing of the valve at the side in the ordinary manner, and the other facing on the bottom of the valve-box, which latter facing it is preferred to make of white metal poured into a recess at the bottom of the valve-box for its reception.

2698.—PRESTON, F. P., PRESTIGE, J. T., and PRESTON, E. J., Deptford, "Improvements in apparatus for regulating and controlling the flow of water for water-closets and fire hydrants." Provisional protection only obtained. Dated July 14, 1876.

In these improvements to an ordinary water-closet, a regulator with supply valve box and valve is fitted, which allows a certain regulated quantity of water to flow into the closet while the supply-valve is falling on its seating.

2933.—STEEL, J., Glasgow, "New or improved apparatus for purifying gas." Provisional protection only obtained. Dated July 18, 1876.

Purifiers constructed according to this invention consist of long cylindrical vessels, of boiler or other plates rivetted or bolted together, and having closed ends. These vessels are carried on two, three, or more sets of rollers, so that as power is applied to drive the rollers the cylindrical vessels are slowly rotated. The vessels are divided internally all round by means of longitudinal and transverse partitions into a continuous series of receptacles, which have the effect, whilst the vessels rotate, of partly lifting up the lime water or other purifying liquid and discharging it again after it has been carried some distance upwards, as well as of preventing the lime water or other purifying liquid from passing, except at a very slow rate, from the admission towards the discharge end of the cylindrical vessels.

A series of long narrow troughs or dippers also extend from end to end of the cylindrical vessels, and these also carry brushwood or wire projecting towards the centre of the apparatus, so that when the lime water or other purifying liquid, lifted by the successive troughs or dippers as the vessels rotate, has been carried to the desired height it is upset over the brushwood or wires, or allowed to fall in a shower, and thereby exposes a very extended surface to act upon the gas passing through the purifier.

The extent of surface kept in a wet state by the lime water may also be further increased by placing at intervals transverse divisions, alternately having a passage for the gas at the centre and the circumference. These divisions, dipping partly into the lime water or other purifying liquid in the lower part of the rotating purifier, as well as by the continuous trickle of the liquid from the brushwood or wires, are kept constantly moist, and by virtue of the openings for the passage of the gas being alternately at the centre and circumference, the rate of flow of the gas being thereby retarded, keep it a longer time in contact with, and therefore under the influence of the lime water or other purifying liquid. Gland joints are provided at the axis of the cylindrical vessels, both at the ingress and egress ends, for the inflow and outflow of the gas; and this not having to pass through a column of water, as in other wet purifiers, may be sent through it at a lower pressure.

The second part of this invention relates to the extracting and collecting of the ammonia from gas. It consists in passing the gas through apparatus like that before described, but which is charged with water or other ammonia-absorbing liquid in place of lime water.

2988.—M'LENNAN, W., Liverpool, "Improvements in lifting and force pumps." Provisional protection only obtained. Dated July 24, 1876.

The nature and novelty of this invention consist in making the working barrel in the form of a hollow cylinder, with the lower part semi-spherical where the piston reciprocates over the inlet branch, which projects down therefrom as a pedestal or stem with a strong flange cast on it for securing it to the deck or other suitable foundation as a basement plate, and to which, or a continuation of it, the lifting main or pipes are attached, preferably by flange joints.

2994.—MESSENGER, T. G., Loughborough, "Improvements in valves for the circulation of hot water, which improvements are also applicable to the circulation of cold water, gas, or other fluids." Patent dated July 25, 1876.

The improvements consist in forming a chamber with two or more valve seats, and valves constructed of brass, iron, india-rubber, or other suitable material, opening and shutting upon the seatings as desired. Two or more valves are secured to a spindle passing through a gland into the chamber containing the seatings, which spindle forms the hinge of the valves, and it is actuated by a handle, toothed quadrant, worm and wheel, or their equivalents.

3010.—SMITH, W., San Francisco, U. S. A., "Improvements in fluid meters or engines for measuring or obtaining power from water, air, or gas." Patent dated July 26, 1876.

This invention relates to improvements in fluid meters, or mechanism applicable to measuring water, gas, or air, or obtaining power from the fluid passing through, the construction of which enables them to be used either as meters, pumps, or engines. It consists of a continuous series of collapsing pistons arranged in a circle within a partitioned enclosing case that has segmental or other suitably arranged cylinders within it, and an inlet and exhaust passage for the fluid passing through the case from one side to the other, so that the fluid in its passage will force the pistons through the cylinders, and thus give motion to the wheel that meshes or engages with the ring or segments which unite the pistons together.

3014.—PARSONS, H., Birmingham, "Improvements in joining or connecting pipes." Provisional protection only obtained. Dated July 26, 1876.

In joining or connecting pipes according to this invention, flanges are made on the ends of the pipes, the flange on one end of each pipe being hollow, and the flange on the other end being solid, and of a size and shape proper to engage in the hollow flange of another pipe, the solid flange of one pipe entering the hollow flange of the other pipe by a sliding motion in a direction at right angles to the axis of the pipe.

3073.—MAGNIAT, H. L., Paris, "A new or improved steam, gas, and water-tight metallic joint." Patent dated Aug. 1, 1876.

This new or improved universal metallic joint is made of a tube of metal (no matter what metal, whether simple or composite), the said tube being filled interiorly with any kind of textile material. The diameter of a joint being taken between the interior of the bolts and the exterior of the orifice, the piece of tube is cut but with an additional two centimetres for the crossing of a small or an average joint, and 3 centimetres for a large one. The two ends are then flattened out by hammer to the form of wedges with very thin extremities, and the form of the flanges of the joint is given to it. The two flattened ends are then closed, and it is placed between the flanges, care being taken to place the junction facing a bolt; it is then tightened up until the key meets with moderate resistance, and if the joint does not then close sufficiently, it is further tightened until a close joint is made. Under this pressure the tube spreads very uniformly—that is to say, as much to the inside as to the outside, this effect being produced by the core of textile material of any kind which is incompressible and without adhesion, thus giving elasticity for the filling up of the surfaces of roughened flanges, and the turning of one flange upon the other without effort, if they are not well placed, and that without tearing

out the material, which would affect the lasting of the joint, and consequently its being used again if taken to pieces before it is worn out.

3092.—MACARTNEY, G., Greenock, "Improvements in couplings for fire-hose, or other pipes or tubes." Provisional protection only obtained. Dated Aug. 2, 1876.

This invention has for its object the improving and rendering more efficient in their action certain kinds of couplings for fire-hose or other pipes or tubes, in which the parts of the coupling are held or locked together by pins, which are screwed through one part catching on a shoulder formed on the other part, and between which a cupped washer or flexible ring is introduced to act as a packing.

3095.—SLATER, J. W., Tamworth Terrace, London, "Improvements in deodorizing and purifying sewage." Patent dated Aug. 2, 1876.

This invention consists, firstly in the use of mixture of hyposulphite and sulphite of lime in the treatment of sewage; and, secondly, in the treatment of sewage with infusorial earth—that is to say, either mixing the earth with the sewage, or filtering the sewage through the earth, or both.

3124.—ROBERTSON, G., Fenchurch Street, London, "Improvements in apparatus for exhausting gas, and applicable for inducing currents of various fluid or pulverized or granular matters." Provisional protection only obtained. Dated Aug. 5, 1876.

One object of this invention is to obtain a simple and simultaneous adjustment where the steam or other motive fluid combines with the gas or other matter to be exhausted or moved in a gradual manner, or at two or more successive stages.

In the apparatus employed, the orifices for the steam-jets are in an annular form, encircling the pipe or passage through which the gas has to be exhausted, and the adjustment of these orifices is effected by means of a single intermediate piece forming a short length of pipe between them. One end of the intermediate piece is screwed into a box fixed on the end of the pipe by which the gas enters the apparatus, and this box has a steam-pipe connected to it, and is formed with an annular channel by which the steam has access to the annular orifice. This orifice is between a nozzle formed in the box and entering into the end of the intermediate piece, which is formed with a conical or funnel throat, so that the orifice is enlarged or diminished accordingly as the piece is screwed out of or into the box. The other end of the intermediate piece is screwed into a second box fixed on the continuation pipe, and having a second steam-pipe connected to it; and in this case the nozzle is formed on the end of the intermediate piece and the conical throat in the box. The intermediate piece has right-hand and left-hand screw-threads at its opposite ends, and is adjusted by turning it by means of a hand wheel fixed on it, the one movement opening or closing both orifices equally and simultaneously.

3138.—FOX, St. G. L., Sussex Place, London, "Improvements in the means or apparatus for lighting and extinguishing gas-lamps by electricity." Patent dated Aug. 8, 1876.

This invention was described and illustrated in the JOURNAL of Jan. 1, page 18.

3145.—CATHELS, E. S., Montreal, Canada, "Improvements in apparatus used in the purification of gas." Patent dated Aug. 9, 1876.

In the arrangement of washers generally the length of the vessel is considerably greater than its breadth, and the gas is caused to flow through it lengthwise, the longest contact of the gas with the vessel's liquid contents, and, therefore, the maximum amount of "wash," being thus presumably secured. But the effect produced—in spite of various contrivances to prevent it—is that the contents are driven by the pressure of the gas into a heap at the outlet end. This seriously impairs the vessel's efficiency, and also increases the back pressure of the gas. To obviate these defects is the object of this invention, and the first distinctive principle of these improvements is to divide the oblong washer, as ordinarily used, by cross partitions, into compartments or sections, each being a complete washer of itself, and together forming one combined washer, the increased power or efficiency of which is as the number of such compartments.

A second important characteristic of the improved arrangement is that instead of these several compartments being on the same level, they are elevated the one above the other in succession, so that when the charge in the lowest or first one is sufficiently strengthened or saturated to be drawn off, that of the second one can be emptied therein, the third one into the second (should there be three), and similarly with the others. In the event of there being more than three such compartments, the uppermost or last one only requires a fresh charge.

A third main feature of the present invention consists of certain arrangements for effectually dividing or breaking up the gas, in order to secure its being brought into more intimate contact with the wash liquid or liquids. Inside of each compartment, and within a few inches of its front plate, there is a plate or curtain (having its lower edge serrated about 4 inches deep), which extends the full length of the compartment, and is bolted to the cover and both ends of the same, but which only reaches say three-fourths of its depth. Coinciding with each of these notches or serrations, there is an inverted V-shaped trough with a flange at each end, fixed at right angles with the curtain, one end being bolted to the curtain, and the other end to the back plate of the compartment, both sides of each trough having serrations, about 2 inches deep, extending its full length.

The liquid charge in each compartment is to be of such a height as to at least cover the curtain serrations, and, consequently, the troughs also, or to any additional height desired. This is effected by increasing the height of the outside self-acting overflow-pipe, attached to each compartment at one end of the washer, by means of a long screw with which it is provided.

The gas way between the compartments consists of a slot or opening in the top of each division plate, extending the whole length of such division plate, but of such a depth only that, multiplied into its length, the area shall equal that of the vessel's gas connecting-pipes. The charges in the respective compartments are emptied into each other by means of outside pipes (having each a stopcock) at one end of the washer connecting the compartments.

The gas, on entering the first compartment, impinges against the curtain, and spreads to both ends, blowing the contents of the narrow chamber or space between the front plate and the curtain into the body of the compartment behind the latter (but the depth of which is not thereby materially increased owing to the great difference of their areas), and, in virtue of the series of unequal dips or seals of the curtain serrations, passes through the same in equally-divided streams, in which state of separation it flows into and along the inverted troughs, and then escapes through the serrations therein in minute streams or threads, in which attenuated condition it bubbles up through the wash liquid. In the subsequent compartments, by reason of the form of their inlet openings or ports, the gas enters each in a thin sheet extending from end to end of the compartment, slides down the face of the curtain, and the washing in a finely-divided form is repeated, the gas finally leaving the washer by the outlet-pipe from the last or uppermost compartment.

The washer may be constructed of cast-iron plates properly jointed and bolted together, wrought-iron plates bolted or riveted together, or of timber



strongly framed, and is to be provided with a filling-pipe (an inverted syphon forming part of it, to prevent the escape of gas when filling), connected to a pump, or supplied from an overhead cistern, and having a stop-cock, the connecting and overflow pipes referred to, together with a pipe leading from the latter to an underground tank, and an emptying-pipe connected to the bottom of the lowest compartment (furnished with a stopcock or valve), the end of it being immersed a sufficient depth in a seal cup to prevent escape of gas, and a pipe leading from the seal cup to the underground tanks.

3161.—THOMAS, J. T., Philadelphia, U.S.A., "*Improvements in apparatus for separating liquids.*" Provisional protection only obtained. Dated Aug. 9, 1876.

The object of this invention is to provide means for effecting the rapid separation of mixed liquids of different specific gravities, specially the ammoniacal liquor and tar which are discharged in a commingled state from the hydraulic mains, condensers, and washers employed in the manufacture of illuminating gas, in order to facilitate the collection of the products for utilization. To this end the improvements consist in the combination of an inlet and an outlet pipe, a tank or chest, a series of moveable dividing plates, and a bridge plate and tar dam.

To carry out the invention an oblong tank or chest is provided, having an inlet pipe or spout connected to one of its ends near its top, through which pipe the liquor is supplied, a tar delivery-pipe being connected to the opposite end near the bottom. A series of vertically-moving dividing plates, varying in number according to the dimensions of the apparatus, are arranged transversely to the tank, and can be adjusted at any desired height therein upon guides or grooves in the sides. Between the tar delivery pipe and the dividing plate nearest thereto, a bridge plate is placed transversely to the tank, extending across the same from the top or thereabouts for the major portion of its depth, and a tar dam extends across the tank between the bridge plate and delivery pipe from the bottom of the tank to a point about the same distance above the lower side of the bridge plate as the distance from the latter to the bottom of the tank. The bridge plate can be adjusted vertically, so as to leave a greater or less space below it, according to the relative densities of the liquors which may be from time to time operated upon; and the height of the tar dam may also be varied as required, by placing an additional strip or strips upon its top. One or more longitudinal openings in the upper portion of the sides of the tank, between the bridge plate and the dividing plate nearest thereto, communicate with a delivery box or boxes, to which are connected the ammoniacal liquor delivery-pipes.

In the operation of the apparatus the dividing plates are adjusted at different heights in the tank respectively, increasing towards the delivery end thereof, by means of wedges, pins, or other suitable appliances. The liquor supplied through the inlet-pipe is compelled, in its traverse of the tank, to pass beneath the dividing plates, which break its current, and cause the subsidence of the heavier particles of tar, the lighter ammoniacal liquor being arrested by the bridge plate and led off through the upper openings to the delivery-pipes. Moreover, the spaces between the several dividing plates constitute chambers, in which the upper strata of liquid, being comparatively quiescent, will be separated, in virtue of the different specific gravities of their components.

It is obvious that a greater or less number of dividing plates may be employed, and, further, that the tank may be so constructed that the current of inflowing liquor will be caused to traverse its length and return in a reverse direction, by means of a longitudinal partition and a connection at the end opposite the inlet-pipe, so as to be delivered adjacent to the latter.

3164.—BROTHERHOOD, P., Notting Hill, "*Improvements in apparatus for compressing air or other elastic fluid.*" Patent dated Aug. 10, 1876.

In carrying out this invention the patentee claims, first, the use of two or other number of pump cylinders fitted with trunk or differential pistons, so that each cylinder is rendered equivalent to a pair of single-acting pumps, of which the one has less capacity than the other; secondly, a method of cooling the trunk pistons of compressing pumps, by causing them to work over stationary tubular plungers communicating with a supply of water.

3173.—YOUNG, W., Clippens, N.B., "*Improvements in carburetting air and gases, and in the mechanism or apparatus employed therefor.*" Patent dated Aug. 11, 1876.

This invention has for its object the regulating the quality or illuminating power of gases made by diffusing the vapours of hydrocarbon fluids through permanent gases, such as are known as hydrocarbon water gas, pneumatic or air gas, and other similar gases.

The hydrocarbon fluids generally employed for this purpose constitute the most volatile portions of the hydrocarbons produced when coal or shale is subjected to destructive distillation, or the most volatile of the petroleum. These fluids consist of a series of hydrocarbons having very different boiling points, and, consequently, diffusible through any permanent gas in very variable proportions. Change of temperature also very much affects the amount of those fluids which may be diffused in them in the form of vapour; the lower the temperature the smaller the volume of vapour diffusible through a given gas. This variableness in the diffusibility of those hydrocarbon vapours through air or gases has, to a large extent, interfered with their practical application for illuminating purposes, for on first bringing the air or gas and carburetting fluid into contact, the volume of vapour taken up by the air or gas is more than sufficient to give the necessary quantity of light; and, on the other hand, when the more volatile portions have been removed by the air or gas, the remaining fluid becomes so heavy that it no longer yields the necessary amount of vapours to the air or gas to afford the desired amount of light; and again, in consequence of changes of temperature affecting the amount of vapours diffusible through the air or gas during cold weather, the light is very deficient; and, *vice versa*, during warm weather the air or gas is over-rich from the excessive quantity of vapours of the hydrocarbon fluid diffused through it at high temperature.

This invention has more particularly for its object to regulate the amount of vapours taken up from a hydrocarbon fluid to the extent which is desired, or which is sufficient to give the desired amount of light. To accomplish that object, advantage is taken of three conditions relative to the diffusion of vapours through gases. These conditions are—

1. The change or increase of volume resulting from the diffusion of vapours through a gas.

2. The change of specific gravity resulting from the diffusion of hydrocarbon vapours through a permanent gas.

3. The change or relative rate of effusion of gases which takes place when a greater or less volume of vapours is diffused through them.

To apply the first condition, two measuring vessels are employed, which are connected together in such a manner that the one shall deliver a measured quantity of the air or gas to be carburetted into the vessel containing the fluid hydrocarbon, or carburetter; the other measuring vessel takes delivery of the carburetted air, and measures it out. The carburetter consists of two or more compartments, so connected with a valve or valves that the air or gases may be made to pass through one or more compartments of the carburetter, as may be desired.

In applying the increased specific gravity from the diffusion of hydrocarbons through a gas or air, to regulate the quantity of vapour to that desired, a carburetter is employed, similar in construction to that already referred to. The carburetter is also provided with a small regulating gas-holder controlling the valve arrangement. The mode of causing the increase of density in the carburetted gas to actuate this gasholder, is to take advantage of the increased weight of a column of carburetted air or gas of considerable height to act upon a supplementary governing gas-holder provided with a valve, which is more or less opened as the column of carburetted air or gas is heavier or lighter; that is to say, should the air or gas be carburetted to a greater extent than is desired, then the extra weight resulting from this over-carburation will relieve the supplementary governing gasholder. This will cause an increased pressure of air to be admitted to the carburetter, which in turn, actuating the regulating gasholder which is balanced to support a column of carburetted air or gas of the desired specific gravity, closes successively the chambers of the carburetter till the proper specific gravity is obtained, and, consequently, the proper amount of vapour diffused through the gas. Or instead of the arrangement just described, a balloon or large chamber may be delicately balanced, and on the carburetter attached to this balance is the valve or valves for regulating the current of gases through the carburetter.

3209.—PEYROUSE, L. A. L. E. P. de la, Finsbury Circus, London, "*Improvements in the manufacture of gas.*" Patent dated Aug. 15, 1876.

According to this invention a method of producing gas is employed which prevents to the fullest extent the condensation of watery and hydro-carburetted vapours generated in the distillation of coal, and consequently the formation of bye-products, by causing these vapours, so soon as they are generated, and by the immediate influence of a higher temperature, to pass into a gaseous state. Such gases are richer, purer than the ordinary lighting gases, and do not require the ordinary washing process.

In carrying out the invention either a single through retort may be used, or two retorts placed side by side, and communicating with one another, so called twin retorts. If a single through retort be used, a charge is at starting introduced into one half only of the retort, the gas produced being led off from the opposite end of the retort. When the greater part of the volatile products contained in the coal have been driven off, the passage of gas from this end of the retort is cut off, and a passage opened for it from the opposite end. A charge of coal is then introduced into the empty end of the retort. The vapours produced from this last charge have consequently to pass through the incandescent and partially exhausted coal before they leave the retort. When the greater part of the volatile products have been driven off from the second charge, the first charge is withdrawn and a new charge introduced in place of it, and the vapours produced from it are caused to pass through the nearly exhausted second charge, and thus the process is carried on continuously. The two ends of the retort are heated by separate furnaces, so that either end of the retort may be retained at the heat required independently of the other end.

When the operation is to be conducted in two retorts coupled together, one retort is first charged, and when the greater part of the volatile products have been driven off from this charge, a charge is introduced into the second retort, and the vapours produced from it are led off through the partially exhausted charge in the first retort. When the second charge has had the greater portion of the volatile products driven off from it, the charge is withdrawn from the first retort, and a fresh charge introduced in place of it, the vapours driven off from this last charge being then conducted away through the second retort, and so on continuously. The two retorts are heated by separate furnaces, so that either of them can be maintained at the desired heat independently of the other.

By the means described the bye-products are reduced to a minimum, and the hydrogen which would have gone to compose them is used in the production of lighting gas. The gas produced will contain little or no ammonia, and the nitrogen contained in the coal will enter into combination with carbon in lieu of forming ammonia. The gas produced may be purified by being passed through the ordinary dry purifiers, first through a purifier charged with lime sprinkled with oxygenated water, or with a solution of some salt containing a large quantity of oxygen, which it can give up without difficulty. The other trays may, as usual, be charged with oxide of iron.

#### APPLICATIONS FOR LETTERS PATENT.

4865.—SILBERMANN, A., Berlin, Germany, "*Improvements in gas blow-pipe machines.*" Dec. 21, 1877.

4875.—THOMSON, W. R. M., Glasgow, "*Improvements in direct-acting vacuum chamber steam lift and force pumps.*" A communication. Dec. 22, 1877.

4894.—CLARK, A. M., Chancery Lane, London, "*An improved rotary pump applicable also as a blower and motor.*" A communication. Dec. 24, 1877.

4919.—WILSON, J. G., Manchester, "*Improvements in and apparatus for carburetting gas to increase its illuminating properties.*" A communication. Dec. 28, 1877.

4928.—KIRKHAM, T. N., Westminster, HULETT, D., High Holborn, CHANDLER, S., sen., and CHANDLER, S., jun., Newington Causeway, London, "*Improvements in apparatus for condensing, washing, and purifying gas and other vapours.*" Dec. 29, 1877.

4930.—LEGENDRE, L., Kennington, London, "*Improvements in pumps or apparatus for raising water and other liquids to any height by suction or by suction and compressed air, and without the liquids passing through the pumps.*" Dec. 29, 1877.

4936.—BOURNE, E., Shifnal, Salop, "*Improvements in balance-pumps for raising or drawing water from deep mines and other purposes.*" Dec. 31, 1877.

4937.—SIMON, H., Manchester, "*Improvements in gas motor-engines.*" A communication. Dec. 31, 1877.

10.—HILTON, M., Prestwich, and JOHNSON, J. and S., Pendleton, Lancs, "*Improvements in the application of gas motors to tram-cars and other self-propelling vehicles.*" Jan. 1, 1878.

12.—ROBINSON, H., and MELLIS, J. C., Victoria Street, London, "*Improvements in the treatment of sewage and impure waters.*" Jan. 1, 1878.

35.—BEAN, E. C., Southsea, and HARRIES, B., Southampton, "*Improvements in the means of and in apparatus for flushing and after-flushing water-closets, and to prevent waste of water.*" Jan. 2, 1878.

39.—BENSON, M., Southampton Buildings, London, "*Improvements in pipe-joints for containing liquids, gases, and air, but more especially applicable to gas and water mains.*" A communication. Jan. 3, 1878.

#### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2644.—HADDAN, F. W., Westminster, "*An improved liquid or water-meter or water-power engine.*" A communication. July 10, 1877.

2647.—MELLING, T., Aigburth, Lancs, "*Improvements in water meters or apparatus for measuring and registering the quantity of water or other fluid flowing through pipes or other conduits.*" July 10, 1877.

2659.—RENNICK, C., Queen Victoria Street, London, "*Improved apparatus for lighting and extinguishing gas.*" A communication. July 10, 1877.



- 2664.—PAINE, W., Anerley, Surrey, "Improvements in liquid-meters." A communication. July 10, 1877.  
 2667.—AVERY, C., Islington, London, "Improvements in rotary engines and pumps." July 11, 1877.  
 2710.—MORGAN-BROWN, W., Southampton Buildings, London, "A new and improved automatic gas-lighter." A communication. July 14, 1877.  
 2725.—HANSON, J., Savile Town, Yorks, "Improvements in treating sewage and other foul water by the use of liquids only, also an improved method of treating sewage and foul water by the use of solid ingredients combined with liquids, and improvements in softening clarified and hard water." July 16, 1877.  
 2766.—CANHAM, W., Liverpool, "Improvements in pumps." July 20, 1877.  
 3019.—BONNEFIN, F. A., King's Cross, London, "Improvements in apparatus for filtering liquids, and separating solid matters therefrom." Aug. 8, 1877.  
 3330.—FOULIS, W., Glasgow, "New or improved apparatus for lighting and extinguishing gas-lamps, part or parts thereof acting as governors for lamps or for analogous purposes." Sept. 1, 1877.  
 3368.—JAGGER, W., Horsforth, Yorks, "A new or improved self-acting metallic packing for parts of steam, air, gas, or other fluid-pressure engines, or for pumps, or other machinery or apparatus in which packing is required." Sept. 5, 1877.

- 3922.—DEWRANCE, J., Borough, London, "Improvements in cocks." Oct. 23, 1877.  
 4071.—KIRKHAM, T. N., Westminster, HULETT, D., High Holborn, and CHANDLER, S., Newington Causeway, London, "Improvements in apparatus for condensing, washing, and purifying gas and other vapours." Nov. 2, 1877.  
 4141.—NEEDHAM, W., KITE, J. and J., jun., Vauxhall, London, "Improvements in machinery or apparatus for filtering or pressing semi-fluids and other matter." Nov. 7, 1877.

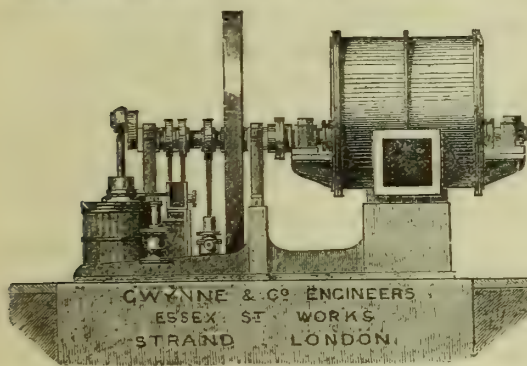
## PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

- 4326.—ALLAIRE, P. L., "An improved manufacturing lighting gas by employing petroleum, schist, or other mineral or volatile oils." Dec. 16, 1874.  
 4357.—GREEY, E. J., "Improvements in mechanism applicable to the construction of gas, steam, or water engines and pumps." Dec. 17, 1874.  
 4365.—SPICE, R. P., "Improvements in the manufacture of gas." Dec. 18, 1874.  
 4404.—MUNFORD, A., "Improvements in apparatus for lighting and extinguishing street and other lamps." Dec. 22, 1874.

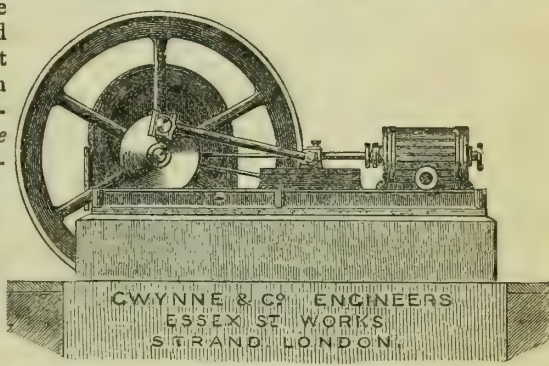
The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

## GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure.

Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

G. & Co. are now making 6 Sets Exhausters and Engines for 105,000 cubic feet per hour, 3 Sets 180,000 Exhausters and Engines with many others of all Sizes.

## NOTICE OF REMOVAL.

D. BRUCE PEEBLES & CO.

Begin to announce that they have REMOVED to their New Premises, TAY WORKS, BONNINGTON, EDINBURGH,

To which all communications should now be addressed.  
May 30, 1877.

THE FARNLEY IRON COMPANY, LIMITED,  
FARNLEY, near LEEDS,  
MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS & FIRE-BRICKS,

Of every size and shape, and of the best quality; also of White and Coloured GLAZED BRICKS, SANITARY PIPES, &c., &c.

In order to meet the constantly increasing demand for their Gas-Retorts, the F. I. Co. have recently made such an addition to their premises as will enable them to execute expeditiously the largest home or foreign orders.

London Agent for Gas-Retorts: D. W. OGG, 3, Jeffrey's Square, St. Mary's Axe, E.C.

" " Glazed Bricks: A. BARFIELD, 22, Great George Street, Westminster.

Now ready, price One Shilling, No. 14 (to be continued Monthly) of  
**A TREATISE ON THE SCIENCE & PRACTICE**  
 OF THE  
**Manufacture and Distribution**  
 OF  
**COAL GAS.**

LONDON: WILLIAM B. KING, 11, BOLT COURT, FLEET STREET,  
OR OF ANY BOOKSELLER IN TOWN OR COUNTRY.

For the convenience of persons resident in remote districts, arrangements have been made by the Publisher to forward the "Treatise" by Post, securely packed, at the cost of 1s. 2d. Monthly, or 7s. for the Half Year.

**WANTED**, Orders for Samples to test the superior silkstone, Wigan, and other Gas Coals and Cannel on Sale by G. J. EVESON, Gas Coal and Cannel Contractor, BIRMINGHAM.  
 N.B.—Prices on personal application, or by post or telegram, on shortest notice, and prompt delivery.

**WANTED**, a respectable, sober Man as GAS-FITTER, capable of working iron or compo tubes, repair meters, and take indices of meters quarterly. 28s. per week will be paid as wages. Certificate of good character indispensable.  
 Address No. 428, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS-WORKS MANAGERS.

**WANTED**, a Working Foreman to take charge of a small Gas-Works in town in the West Indies. Must be a thoroughly practical Man, and able to speak the Spanish language. Salary £15 per month. Copies only of testimonials, and references, to be forwarded to No. 430, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.



**WANTED, for the Seaham Harbour**  
Gas-Works, a practical Man for Gas-Fitting, Pipe-Laying, &c. Wages 27s. per week, with a free house. None but steady men need apply, with references, to J. WHITE, on or before Thursday, the 17th inst.

**WANTED, by a Continental Gas Com-**  
pany, a respectable, energetic young Man as **METER INSPECTOR** and practical **GAS-FITTER**. Wages £12 per month.

Applications, in own handwriting, with copies of testimonials, addressed No. 429, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, the Address of Gas Com-**  
panies who have not received a Copy of the New Edition of **PAMPHLET for GAS COMPANIES** to distribute to their Gas Consumers—"Cooking and Heating by Gas."

Price £1 per 100, £6 per 1000. Copies by post Three-pence—direct from the Author, **MAGNUS OHSEN**, Gas-Works, SYDENHAM, S.E.

**WANTED, by Samuel Thompson & Co.,**  
Colliery Office, Lancaster, APPLICATION for **PRICES** from Gas Managers who are prepared to receive Tenders for **GAS COAL** or **CANNEL**.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

#### WIGAN BOROUGH GAS-WORKS.

**WANTED, a thoroughly practical**  
**FOREMAN** Main and Service Layer. Preference will be given to one who has already held a similar position in a large Works. None need apply whose character and ability will not bear the strictest inquiry.

Apply, in own handwriting, to the Manager of the Gas-Works,  
J. G. HAWKINS.

Dated Dec. 27, 1877.

**ON SALE—One Station-Meter, to pass**  
1000 cubic feet per hour. Almost new. Will be sold cheap.

Apply to J. HALL, Gas-Works, St. Helen's, LANCs.

**FOR SALE, One Gasholder, 33 ft. by**  
14 ft., with cast-iron tank, columns, girders, inlet and outlet pipes, and valves.

Apply to Mr. JOHN BUDDEN, Gas-Works, Poole, DORSET.

#### GAS-WORKS FOR SALE.

**THE Proprietors are prepared to receive**  
OFFERS for the Wymeswold (Leicestershire) Gas-Works. The Works consist of Retort-House, with a bunch of two and a setting of one retort, Coal-Store, a comfortable Foreman's House, Meter-House, and Store-Shed, together with Retort-Fittings, Condenser, Scrubber, Two Purifiers, Meter, Governor, and Gasholder to contain about 5000 cubic feet, as well as the whole of the Mains throughout the village.

The streets are lighted up by 26 public lamps. The Works are of recent date, in very good condition, and are well situated.

The gas and meter rental amounts to over £200 per annum, and the consumers are steadily on the increase.

Further particulars to be obtained of Mr. J. B. BALL, Gas Engineer, LOUGHBOROUGH.

#### GAS PLANT FOR SALE.

**THE Directors of the Newcastle and**  
Gateshead Gas Company have **FOR SALE** the following **ARTICLES** lately used at the Gas-Works, Blaydon—viz.:

One Scrubber, 18 ft. high and 8 ft. diameter.  
Set of Condensers, consisting of six 14-in. pipes, with bridge-pipes.

Three Purifiers, 7 ft. 6 in. square, and lifting apparatus.

21 5-in. Ascension-Pipes.

54 ft. Hydraulic Main, D-shaped, 18 in. by 18 in.

One Gasholder, 35 ft. diameter.

Four Columns for do.

One Station-Meter, 5-in. inlet.

One Governor.

With other necessary connexions, all of which may be seen at the Gas-Works, Blaydon.

Further particulars may be obtained from the undersigned, to whom written offers, either for the whole or part, should be sent on or before the 29th inst.

Wm. HARDIE, Secretary.

Neville Street, Newcastle-on-Tyne, Jan. 2, 1878.

#### TENDERS FOR SULPHATE OF AMMONIA.

**THE Directors of the Cork Gas Con-**  
sumers Company are prepared to receive **TENDERS** for all the **SULPHATE OF AMMONIA** to be manufactured at their works during the year 1878. Delivery f.o.b. Cork. Probable quantity 100 tons. Payment net cash on delivery.

Prices to be fixed on basis of 24 per cent. Ammonia, and tenders to state whether packages are to be supplied free by sellers.

Tenders will be received up to Friday, Jan. 11, 1878.

By order,

DENNY LANE, Secretary.

Company's Offices, 72, South Mail,  
Cork, Dec. 13, 1877.

#### TO GASHOLDER MAKERS, &c.

**THE Directors of the Northampton Gas**  
Company are prepared to receive **TENDERS** for a Telescopic **GASHOLDER**, 100 feet diameter by 30 feet deep.

Plans and specifications may be seen at the Offices of the Company on and after Monday, Dec. 31, and copies of the specification and particulars may be obtained on payment of One Guinea.

Tenders, addressed to the Chairman, endorsed "Tender for Gasholder," to be delivered at the Office of the Company on or before Wednesday, Jan. 24.

The Directors do not bind themselves to accept the lowest or any tender.

JOHN EUNSON, jun., Engineer.

Northampton, Dec. 21, 1877.

#### TENDERS FOR SULPHATE OF AMMONIA AND TAR.

**THE Directors of the Devonport Gas and**  
Coke Company are prepared to receive **TENDERS** for their make of **SULPHATE OF AMMONIA** and their surplus **TAR** for a period of Six or Twelve months, from the 1st of February, 1878.

Estimated make of Sulphate about 90 tons per annum. Tar about 50,000 gallons.

Specifications may be had on application to the Secretary. Tenders to be delivered on or before Monday, the 14th day of January, 1878, addressed to the Chairman, Devonport Gas and Coke Company.

By order,

JOHN WILLING, Secretary.

#### TO IRONFOUNDERS & GASHOLDER BUILDERS.

**THE Directors of the Devonport Gas**  
and Coke Company are prepared to receive **TENDERS** for the erection at their Works of a **TELESCOPIC GASHOLDER** and **Iron TANK**, about 80 ft. diameter and 24 ft. in depth.

Plans and specifications may be seen at the Offices of the Company, where copies of the latter may be had on application. Tracings of the set of drawings will be forwarded on receipt of P. O. order for One Guinea.

Tenders are to be sent in on or before Monday, the 29th inst., endorsed "Tender for Gasholder and Tank," and addressed "To the Chairman, Devonport Gas and Coke Company, Devonport."

The Directors do not bind themselves to accept the lowest or any tender.

JOHN WILLING, Secretary.

Devonport, Jan. 1, 1878.

#### STAINES AND EGHAM DISTRICT GAS AND COKE COMPANY, LIMITED.

##### TO GASHOLDER MAKERS.

**THE Directors of this Company invite**  
**TENDERS** for the supply and erection of a **TELESCOPIC GASHOLDER**, with two lifts of 18 ft. each; the outer lift to be 50 ft. 6 in. in diameter.

Tenders, marked "Tender for Gasholder," to be sent to the Secretary on or before Saturday, the 26th of January inst.

The lowest or any tender will not necessarily be accepted.

The plans and specification may be seen at the Secretary's Office, at Staines, and further information obtained of him, or of the Manager, at the Gas-Works at Egham.

JOHN ANTHONY ENGALL, Secretary.

Staines, Jan. 4, 1878.

#### DEVIZES CORPORATION WATER-WORKS.

##### CONTRACT No. 5.

RESERVOIR, ENGINE-HOUSE, Etc.

**THE Town Council of the Borough of**  
Devizes (acting as the Urban Sanitary Authority) are prepared to receive **TENDERS** for the construction of a Covered **RESERVOIR**, **ENGINE** and **BOILER HOUSES**, and other Works connected with the above Contract.

Plans and specifications may be seen at my Office in Devizes, or at the Office of the Engineer, Mr. Henry Tomlinson, 4, B-n-el Street, Cambridge, and bills of quantities can be obtained on payment of One Guinea each.

Tenders (endorsed "Water-Works, Contract No. 5") must be sent to me on or before Monday, the 21st inst.

The Corporation do not bind themselves to accept the lowest or any tender.

A. GRANT MEEK, Town Clerk.

Devizes, Jan. 2, 1878.

#### CAMBRIDGE GAS-WORKS.

##### TO BUILDERS AND CONTRACTORS.

**THE Directors of the Cambridge**  
University and Town Gaslight Company are prepared to receive **TENDERS** for the construction of a Retort-House, Coal-Sheds, Purifying-House, Meter-House, Residence, Office, and other works.

Drawings and schedules of quantities may be obtained on payment of the sum of Three Guineas, to be returned on receipt of a *bona fide* tender at the Office of the Company, in Sidney Street, Cambridge, and at the Office of Messrs. Thomas and Charles Hawksley, Civil Engineers, 30, Great George Street, Westminster, S.W., on and after Thursday, the 3rd day of January next, and tenders must be delivered at the Office of the Company on or before Wednesday, the 16th day of January next.

The Company do not pledge themselves to accept the lowest or other tender.

By order,

WILLIAM FREED, Secretary.

Cambridge, Dec. 20, 1877.

##### REMOVAL.

**CHARLES HEISCH, F.C.S., Analytical**  
and Consulting Chemist, Superintending Gas Examiner to the Corporation of London, &c., &c., has **REMOVED** from 8, Savage Gardens, to 79, MARK LANE, where he may be consulted as usual.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

J. C., Leeds.—Your letter reached us too late for insertion in the present number.

THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 15, 1878.

Circular to Gas Companies.

THE quarterly report of the Chief Gas Examiner again affords evidence that the Gas Companies whom he supervises faithfully fulfil their obligations to the public. Still it will be seen the Metropolitan Board of Works have had several opportunities of prosecuting, if they had chosen to avail themselves of them, unless, indeed, the Companies appealed, and obtained absolution from the Chief Gas Examiner. Nevertheless, it is clear every Gas Company under the Chief Examiner supplies gas, as a rule, considerably exceeding the standard. This fact should be borne in mind when further prosecutions are contemplated. As regards impurities, Dr. Williamson also reports very favourably. He will forgive us for putting him right upon a small point. The amounts of these impurities are not fixed by Act of Parliament, except, it may be said, in the case of sulphuretted hydrogen,

the complete absence of which is prescribed by all Gas Acts. The amounts of ammonia and of sulphur in other forms than that of sulphuretted hydrogen, are fixed by the Metropolitan Gas Referees, in virtue of powers granted by the special Acts. With respect to these impurities, our readers will notice that the Companies keep well within the limits prescribed by the Referees. The "sulphur" difficulty, we might almost say, is conquered, so excellent are the results of the purification. This has doubtless been achieved at some expenditure of trouble and money; but the public will note with satisfaction that the purification has been accomplished, and, so far as we know, without any complaint of nuisance. In addition to the evidence of the Examiners appointed by the Metropolitan Board of Works, we have the independent testimony of the two Medical Officers of Health who respectively test the gas for Marylebone and St. Pancras. The reports of these two gentlemen bear witness to the good faith of the Chartered Gas Company. Dr. Stevenson's report shows that the gas supplied to the parish of St. Pancras during the last month had an average illuminating power of 16·8 candles, the minimum being more than half a candle above the standard. It must be clearly understood that this gas is supplied by the Chartered Company, and is probably a mixture of gas made at two stations.

The Chelsea Vestry are always dissatisfied. They persecute the Chartered Company for what they are pleased to call a nuisance at their Fulham works, and they would, if they dared, prosecute the London Gas Company for supplying fifteen and a half candle gas, when that Company are only required to furnish twelve-candle gas. Chelsea is blessed with a Medical Officer of Health, whom it would be difficult to satisfy in any single particular. Dr. Barclay, we imagine, is constitutionally dyspeptic, and takes gloomy views of all mundane matters. He reports to the Vestry that the gas is only kept up to the parliamentary standard by the use of a patent burner, a statement that may be accepted with some qualification. The patent burner in question simply shows the amount of light which the gas will yield. If, with a less perfect instrument, the gas gives an illuminating power of only twelve candles, it is the fault of the instrument, and not of the gas, and we repeat that the London Gas Company, by giving, on an average, fifteen and a half candle gas, deserve the gratitude, instead of the abuse, of the Chelsea Vestry. They may send their memorial, if they like, to the Metropolitan Board of Works, but we may tell them that nothing will come of it, even if the Company did not, as they do, fully satisfy all legal demands. The Metropolitan Board would be powerless in the matter. In the course of a few years the London Gas Company must go to Parliament, and will then be subjected to all the provisions imposed by modern Metropolitan Gas Legislation. But the Chelsea Vestry will not be in the least benefited. They may have gas of a slightly higher illuminating power, but the consumers will waste it in bad fittings and burners, as they do to-day. Nothing is to be gained by this continued gas agitation, even if a substantial grievance existed, but there is nothing of the sort in Chelsea. The complaints against Gas Companies originate in, and are maintained by, ignorance, jealousy, and prejudice, and we may expect that they will continue as long as Companies exist. Equal grounds of complaint would remain if the supply of gas were in the hands of some Local Authority, but nothing would then be heard of the matter, for everybody knows that complaining to a Local Authority is perfectly useless.

The newly-born Midland Gas Managers Association held their first meeting in Birmingham last week. The chair was occupied by Mr. C. Hunt, the President. A very interesting Inaugural Address was delivered, for which we are sorry we cannot find space to-day, but will publish it next week. The Association start under good auspices, and have our best wishes for their success.

The Corporation of Glossop have gone to law with the Gas Company on an interesting point. The Company have, of course, the right to take up the roadways, and they are equally of course under the obligation to reinstate them in full repair. The Corporation complain that, after opening a considerable length of roadway and pavement in 1876, the Company left it in a very unsatisfactory state. Consequently, the Borough Surveyor was instructed to put the road in order, and for the cost of doing so the Corporation now sue the Company. An order has been made in favour of the former, but it will be appealed against on purely technical grounds. The Companies Clauses Consolidation Act directs that proceedings shall be taken within six months after the commission of the offence. In this case it is not quite clear to us when the offence was committed, and it is on this point, we rather think, that the lawyers will wrangle. It is a complaint frequently brought against Gas Companies, that they leave a road, after breaking it up, in a bad state; but the charge is generally unfounded.



The Bill promoted by the Clitheroe Corporation for the purchase of the undertakings of the Gas and Water Companies has been approved by the Town Council. We understand that the terms have been arranged on a satisfactory basis, and that both undertakings will pass into the hands of the Corporation.

The Local Board of Torquay promise to persist in their unreasonable opposition to the Bill promoted by the Torquay Gas Company. The Bill is simply to gain the extended powers which are always required by the growth of an undertaking. More share and loan capital is necessary for the extension of works and distributing plant. Instead of complaining, the Local Board of Torquay should be grateful to the Gas Company for the provident foresight which seeks to prepare for the future wants of the town and neighbourhood. The new capital asked for will not be raised all at once, and we may take it for granted that none will be raised except as it is required for productive works. Then, again, the Local Board may remember the conditions under which Gas Companies may raise additional capital. We do not know whether the Torquay Gas Company will be able to show reasons why they should not be subjected to auction clauses and a sliding scale, but we may take it they will have none to offer. Consequently the new capital will be raised in a manner most beneficial to the consumers.

A town's meeting at Newbury has approved of the promotion of a Bill which, among several other things, sanctions the purchase by the Corporation of the Newbury Gaslight and Coke Company. It is a very insignificant place, and when the borough is extended, it will not become of greater importance. Supposing the Gas Company to obtain a fair price for their undertaking, they may cheerfully abandon it to a Corporation always given to grumbling, and very difficult to satisfy. The worst of it is that when a Gas Company, who have served the public fairly, part with their undertaking to a Corporation, all complaints cease, not because the grounds of complaint are removed, but because the public know full well that it is no use complaining. Take, for instance, the public lamps in Newbury. No man who knows anything of the business will for a moment suppose that they will be better supplied by the Corporation than by the Company. We well know that, with the best system of regulation, the consumption in public lights will, from unavoidable causes, differ considerably. The variation of consumption, which is spoken of in Newbury, is quite unimportant. We have found public lights, contracted for to burn five feet, actually to consume any amount, from three feet even to twelve feet per hour. Any one who chooses to go round a town and pick out all the small lights will believe that the ratepayers are being cheated; another, who observes only the larger flames, will conclude the Gas Company are too liberal. It is the case of the two knights who looked on the opposite sides of a shield. The Corporation of Newbury can have the Gas-Works if they will pay for them, but do not let any ratepayer in the Borough imagine that he will be a whit better off in consequence of the transfer.

If the Council of Newbury wish to know what lies before them in the future, they might read with profit the proceedings at a recent meeting of the Hindley Local Board, who, two or three years ago, acquired the gas undertaking. The works cannot be said to be a complete failure, but they are not specially remunerative. The pipes, it would appear, have the faculty of conveying water as well as gas, and hence the supply of the latter commodity is in some localities very short. At the present moment the question before the Local Board is the substitution of larger for smaller mains, in order to avoid the enormous leakage which existing circumstances make unavoidable. Protracted discussion in the Board ensues, and the members find it difficult to make up their minds as to what is to be done. Instead of at once accepting the advice of their Manager, members of the Board, who know nothing whatever of the matter, talk and talk, meet and adjourn, and the condition of things remains unimproved. When will Local Boards learn wisdom, and rely on sound professional advice?

Under very depressing circumstances, the Bilston Gas Company have during the past year made a very respectable profit, and are able to pay a fair dividend. In towns circumstanced like Bilston, the employment of gas is much affected by the limitation of manufacturing operations. The consumption of gas is greatly restricted, and the sale of coke becomes limited, even when offered at a very low price. These troubles are common to very many Gas Companies in the Midland district, and all we can say is that the Bilston Company, who have exerted themselves to the utmost, have so far come out of them very well. Trade, we hope, will soon revive, and then they will reap the reward of their exertions.

We have so often cautioned ignorant people against searching

for a gas leak with a lighted candle or a match, that we may refer for a moment to the unhappy explosion which occurred at Southport, by which a very intelligent gentleman lost his life. He did what we have always recommended people to do, when they detect a leakage. He opened the windows of the room in which the smell of gas was discovered, and he turned off the gas at the meter; but he forgot that time was necessary for the diffusion and dilution of the escaped gas. By igniting a match immediately, he caused an explosion, which destroyed the roof of the building, and occasioned the fall of a beam, which unfortunately came down upon the Doctor, and instantaneously killed him. To the recommendations we have previously given, this unhappy incident obliges us to add one more. Besides opening all the doors and windows, and turning off the gas, it is necessary to allow a considerable time to elapse before a leak is looked for with a light. We are not perfectly informed as to the nature of the fittings in this particular case, but we are induced to believe that an ordinary water-joint pendant was in use. This apparatus is peculiarly defective. It is ill understood by consumers, who, disregarding the fact that water will evaporate, labour under the impression that it will last for ever. Cannot our scientific gas-fitters invent a joint which will protect the public from the dangers of the water-lute?

It is needless to say that we heartily sympathize with both Mr. R. H. Patterson and Mr. G. Anderson in their efforts to effect the complete purification of gas in closed vessels, by the use of ammoniacal liquor in some condition or other. It is to this we are coming, but too slowly. Still, as regards patents, we feel bound to express an opinion that there is not one at present in existence which will hold water. Mr. Patterson and Mr. Anderson have both been, to a certain extent, anticipated, and we are of opinion that only mechanical arrangements for accomplishing the desired object can form the subject matter of a valid patent. Nothing is more easy than to remove every trace of ammonia from the gas, but when we come to the removal of "sulphur," another question arises. To take out bisulphide of carbon, more lengthened contact of the gas with sulphuretted ammoniacal liquor is required; hence another difficulty arises, which we have no doubt Mr. Anderson and Mr. Patterson can easily surmount. But we have an entire objection to patents, which, for the most part, stand in the way of progress. We are very sorry when an apparent injustice is done to original inventors, but their fate is inevitable.

At a ratepayers meeting in Bangor, the promotion of a Bill to make a compulsory purchase of the Water and Gas Company's undertakings was approved, and it will probably give rise to an interesting parliamentary fight. The Company are not unwilling to sell their undertakings, but they ask £70,000, while the Local Board of Bangor offer only £42,000. Both parties are promoting Bills, and, supposing that of the Local Board to pass into an Act, unless an agreement be come to, the case must go to arbitration. We have no figures before us, but the wide discrepancy between the offer of the Local Board and the demand of the Company suggests that there are real grounds of opposition on the part of the latter. The terms of compulsory purchases are now so well understood and recognized, that we cannot imagine the Company to have made a mistake in their calculations. Local Authorities are always looking out for bargains, but their parsimony generally defeats their object.

Mr. W. Sugg has published a table, showing the number of hours between sunset and sunrise during the year, which will be useful to all Gas Companies and Local Authorities. It will save numerous references to almanacs, and may be considered to be the lamplighter's guide through the year. The publication of the table is well timed, for at the present moment there is a good deal of excitement anent public lighting. The table should be hung up in the office of every Gas Inspector, for the instruction of his subordinates as to the times they should light and extinguish.

### Water and Sanitary Notes.

THE Thirlmere scheme receives a little opposition in the Manchester Town Council. It does not amount to much, however, and the opponents, not denying that an additional supply will in the course of a few years be necessary, favour the Ulleswater rather than the Thirlmere scheme; why, we cannot understand. Without professing to be acquainted with all the engineering details, we are inclined to think that the Thirlmere scheme offers the greater advantages, since the water will find its way to Manchester by gravitation alone. What the works will cost nobody seems to know, and it is variously estimated from two and a half to five millions. The very interesting account given by Mr. Alderman King, and reported in another column, as to the cost



of the existing works, shows how estimates are exceeded as works progress. If we suppose the new scheme to be carried out, it will be ten years before its entire cost is known, and if it be true that Manchester is at the present time losing £10,000 a year by supplying water, it seems tolerably clear that the ratepayers must suffer when the Thirlmere scheme is completed. A great good will, however, have been accomplished, and a somewhat heavy water-rate will be amply justified. As regards the supply of water for trading purposes, to which Mr. Alderman King seems to object, we think it is imperative on the Corporation to furnish such supply, but they should charge an adequate price. The idea of fixing Abyssinian pumps about the city would never be tolerated. It will be seen at once that the water might be used for drinking purposes, and the Medical Officer of Health would certainly report them as dangerous, and the Corporation must order them to be closed. Besides that, pure water is essential for success in most manufacturing processes. The opposition in the Council, as we have said, was very slight, and we hope in a few months to see the Thirlmere scheme carried through Parliament.

An Association of, we may take it, riparian proprietors in Scotland, have had a meeting to denounce the inefficiency of the Rivers Pollution Prevention Act. They wish everything to be done at once, but they must have a little patience. A manufacture cannot be immediately sacrificed for the sake of trout and salmon and the fly-fisher. The Act, as it is, is working fairly well; it has its defects, but as these become more and more apparent they will, no doubt, be remedied. A few years trial of its action will show what amendments are required, and the Government of the day will, no doubt, take care that it shall be amended accordingly. The Scottish gentlemen make one very sensible, although not an original suggestion—that is, that Conservancy Boards should be formed with power to put the Act in force. Local Authorities, they seem to think, are not to be trusted, being for the most part traders and manufacturers. A Conservancy Board, made up of manufacturers and country gentlemen in equal proportions, would, no doubt, deal with the matter in a more satisfactory manner. In England, especially, we want Conservancy Boards, and we hope the next session will not pass away without giving us some general provision for their formation.

The hydrants fixed in the City of London appear to be doing very effective service. One fire has been extinguished by their use alone, at another they were furnishing an adequate supply of water until a too energetic turncock opened three fire-plugs, thereby reducing the pressure on the main. The arrangements of the Corporation of London respecting these hydrants are not yet, we believe, completed. Many more are to be fixed, and hose and jets have to be provided. There cannot, however, be a doubt that our means of extinguishing fires have been greatly improved by what the Corporation have already done.

A bogus Water Bill has, we expect, disappeared. The Corporation of Exeter having agreed to purchase the undertaking of the Exeter Water Company, the promoters of the Dartmoor and Exeter Water Supply Company, Limited, have offered to sell to the Exeter Corporation an undertaking, which exists upon paper, for the sum of £2000, and the Town Council have accepted the offer. It was stated at the Council meeting, that the Dartmoor Company had been in existence six weeks; but this statement is, perhaps, not quite correct. What is true appears to be that the Town Council have voted away £2000 of the ratepayers' money, and for—nothing. The Dartmoor scheme would have had no chance of success in Parliament, even if the existing water-works had remained in the hands of the old Company. Under the altered circumstances, the promoters could not have had the temerity to proceed with their scheme. It looks as though a gross job had been perpetrated, and the ratepayers had better look into the matter.

The Sevenoaks Local Board are more cautious than the Exeter Town Council. The Sevenoaks Water Company are promoting a Bill to obtain incorporation, with the usual statutory powers. There is nothing at all objectionable in the Bill; but some members of the Local Board view it with much distrust, and they have resolved to oppose it, *if necessary*. They have not yet, however, obtained the consent of the ratepayers, who, if sensible, will think twice before they allow their money to be scattered between lawyers, engineers, chemists, &c.

The experience of West Derby is not encouraging to irrigation farmers. It appears that in the course of six years in which the farm has been in operation, a loss of over £20,000 has been incurred. It is suggested this might have been saved if the farm had been properly worked. Unfortunately, most sewage farms appear to be badly worked, for they rarely produce any profit. They absorb and purify sewage, however; and that being effectually done, ratepayers may be satisfied.

## PROGRESS OF CHEMISTRY.\*

## SECOND NOTICE.

Some of the most important work performed by Dr. Frankland relates to the examination of water, and the various papers he has written and the lectures he has delivered on this subject are contained in this volume. On succeeding Dr. Hofmann, and undertaking the examination of the metropolitan waters for the Registrar-General, he found a process of analysis in use which we rather think had been built up from the successive researches of Rose, Fresenius, and Schweitzer. It may be confessed that this process, accurate enough so far as the mineral constituents of the water are concerned, is very defective when it is desired to make an exact determination of the organic matter. It was, then, to supply an obvious defect that Dr. Frankland directed his efforts; and, after two years' labour, aided by his pupil, Mr. Armstrong, he perfected what is known as the combustion process. In skilled hands, this process, with the use of well-appointed apparatus, undoubtedly yields accurate results—that is, it shows the exact amount of carbon and nitrogen in a water residue. The use of it, however, can never become general among chemists. The apparatus is somewhat expensive, its use involves a great deal of trouble, and requires much skill in manipulation. There are, we rather think, only four chemists in the United Kingdom, besides Dr. Frankland himself, who profess to employ his mode of analysis. We shall not stop to criticize the process—a work that has been done by abler hands than ours—but we may ask, When we have been told the exact amount of carbon and nitrogen present in the water, what have we been taught? Nothing, as regards the origin of the organic matter that furnished the carbon and nitrogen, which is the fact we most wish to know. When Dr. Frankland reports, as he did last week, that some of the organic matter had a very objectionable origin, he must resort to some mode of examination other than his analytical method. He has to rely on the microscope for the detection of matters which may be said to be directly offensive. In other respects it may be admitted that the process is good, always supposing it to be carried out by competent and conscientious hands.

The mode of estimating organic matter, devised by Messrs. Wanklyn, Chapman, and Smith, has, from its simplicity, acquired great popularity, and is now almost the sole method in use; but, like Dr. Frankland's, it requires for its perfect execution great care and skill. In the book we notice will be found the papers in which Dr. Frankland severely criticizes this method. We need not, however, enter upon the vexed question of the relative accuracy of the two modes of analysis to which we have referred. Each has its merits, and analytical chemists will use one or the other, according to their tastes and circumstances. Dr. Frankland utterly discards the permanganate method, in which the late Drs. Letheby and Miller had so much faith. There may be a fallacy in making a quantitative estimation of the organic matter from the quantity of oxygen consumed within a given time in its presence, but we believe it to be a very useful qualitative test.

Dr. Frankland has, as our readers may remember, written a good deal on the composition of sewage, and the modes practised and suggested for its purification. The method he most approves of is the intermittent downward filtration system; but he believes, or at all events did in 1865, that irrigation, which answers nearly as well, may be a source of profit to a town. He has, perhaps, by this time, changed his opinion on this latter point. For chemical methods of purification he has no respect at all. He regards them as simple clarifiers, which leave unaffected the organic matter in solution. Clarification is, however, something, and but for the expense of a double system, we should always recommend suspended matters to be removed before sewage is used for irrigation, and, certainly, before it is sent into a stream. There is one point with which we, with all respect for Dr. Frankland, must disagree with him. He disbelieves in the oxidation of sewage matter in running water, and tells us that "there is no river in the United Kingdom long enough to secure the oxidation and destruction of any sewage that may be discharged into it even at its source." Perhaps this statement may be true if complete oxidation is meant. But Dr. Frankland must allow that even a run of ten miles from the inlet of sewage, in some cases, makes a great change in the amount of organic matter. At one time, we imagine, Dr. Frankland must have believed in the oxidation of organic matter in running streams, for in 1868 he wrote as follows:—"If the shell of an egg were broken, and its contents beaten up with water, and thrown into the Thames at Oxford, the albumen might be converted into mineral compounds before it reached Teddington." It may be that continued experimentation has induced him to change his views on the subject; but still, for our own parts, and from our own experiments, we believe in the oxidation of sewage in running water.

Dr. Frankland is a strong advocate for the use of soft water. In one instance, and we believe in one instance only, so far as the domestic use of water is concerned, is hard water objectionable. There can be no doubt that in laundry operations there is a certain amount of waste of soap, but we believe that the amount of this waste is greatly exaggerated. In the matter of tea, we fancy that greatly mistaken notions prevail. A hard water—we mean, of course, a moderately hard water—will dissolve theine, and the flavouring matter of tea, just as well as a soft water; but people want something more than flavour; they will have colour if they can get it, and for this soft water is necessary, or the use of carbonate of soda is required. The result is the production, especially after long standing under that ugly abomination, the cosey, of that nasty vivid infusion which passes

\* "Experimental Researches in Pure, Applied, and Physical Chemistry." By E. Frankland, Ph.D. (Marburg), D.C.L., F.R.S., &c. London: Van Nostrand, 1877.



in society as tea. Vegetables are quite as well boiled in hard water as in soft, and we are told, on very good authority, that potatoes are the better for being boiled in hard water. We rather think that Dr. Frankland is somewhat mistaken as to the sanitary effects of soft water. *Ceteris paribus*, we believe that towns supplied with hard water are more healthy than those supplied with soft; but the facts that govern the rate of mortality have been so imperfectly studied, that it is hazardous for us to express any opinion on the matter. Most certainly, we think, it may be said that the soft water towns of the North have the highest rates of mortality; but then it is to be remembered that they have also the densest populations.

We have filled all the space we can devote to this notice, and must now conclude. We have not referred to the first section, which gives an account of researches which earned for the Author an European reputation. Released from the labours incident to the Rivers Pollution Commission, let us hope that Dr. Frankland will return to the object of his first love—pure chemistry. If he will cease from his persistent attempts to scare the public and damage the Water Companies, and betake himself to such studies as occupied him in 1848-49-50, he will acquire a wider and more enduring fame than can ever be obtained by water and sewage quackery, on which the whole Metropolis looks with contempt.

### A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLV.

DISTRICT GOVERNORS (*continued*).

Mr. W. White's automatic valve-governor is exhibited in the annexed woodcuts, figs. 9 and 10, which are a vertical section and an elevation with lid removed to show the interior of valve-chamber. In a cast-iron box or chamber is contained a flap-valve, hung by a strap, and hinged at two places to ensure the metallic valve, which is faced, always coming into close contact with the seat. This latter is at a slight inclination from the vertical, so that the tendency of

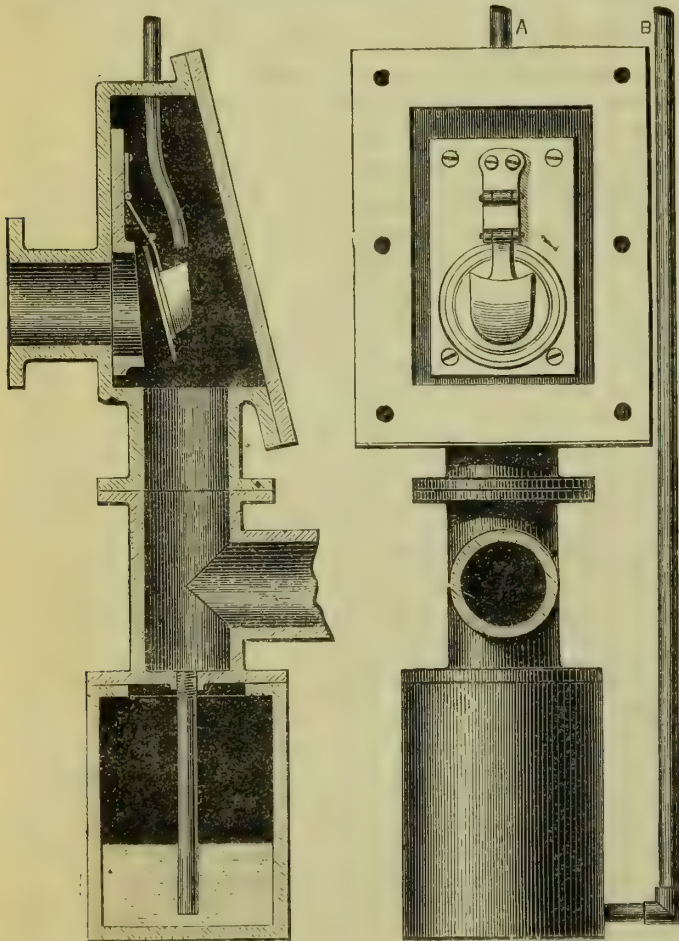


FIG. 9.

FIG. 10.

the valve is to close. For the purpose of weighting the valve to the pressure desired, a pipe, A, is brought to the surface, through which lead shot is dropped into the pocket fixed to the back of the flap. A syphon-box is attached to the bottom of the governor to receive the fluids condensed in the main, the vertical pipe, B, shown in fig. 10, being for the purpose of applying a pump at the surface for emptying the same.

A compact and useful district governor has been invented by Mr. W. Foulis, and is illustrated in fig. 11. This apparatus, which is made by Messrs. W. and B. Cowan, is altogether novel in design; and, being most sensitive in its action, and occupying the minimum of space for a wet governor, it is peculiarly valuable for the purpose intended. The drawing represents one for an 18-inch pipe, and is to a scale of three-fourths of an inch to the foot. The outer case, A A, is of cast iron, closed both at top and bottom, and having a valve-seat, D D, cast within it. B is the inlet, and C the outlet pipe. The

valve, E, is formed of two inverted cones, having a cylindrical prolongation, with the necessary float, the object of making the cone double being to neutralize the effect of the inlet pressure; or, in other words, to prevent the inlet pressure from exerting any influence on the action of the governor. In order further to attain this object,

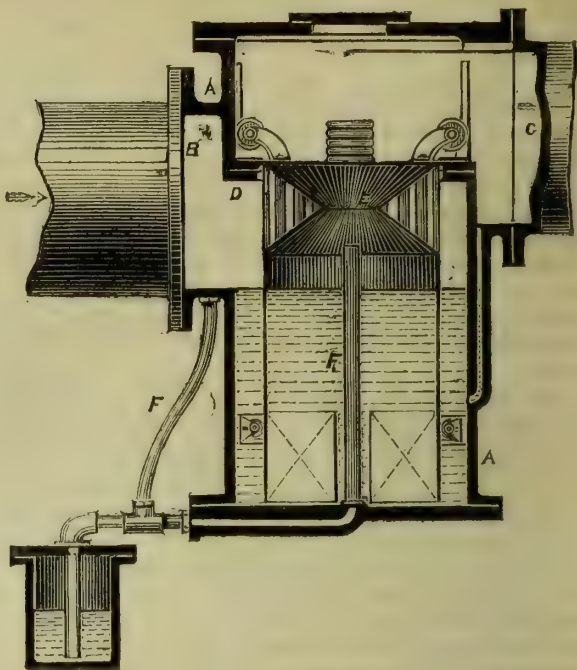


FIG. 11.

the triangular space formed by the two cones is enclosed by a continuation of the cylindrical portion of the valve. In this, slits are cut of sufficient area, and so adjusted that when the valve is open to the full, the area of the portion of the slits below the valve-seat is rather greater than that above it, thus establishing a uniform pressure in the triangular space, and so equalizing the pressure on the two conical surfaces.

A small pipe, F, is led in at the bottom of the outer case into the interior of the valve. The valve is guided by three pulleys fixed on its top, and the same number of pulleys attached to the outer case at some distance from the bottom. By this arrangement the valve may be withdrawn on removal of the top cover. The vessel is charged with glycerine to prevent freezing. The apparatus is used as a station governor, but it is with its arrangement as a district governor that we are now dealing. When the pipe, F, is connected with the inlet-pipe, and the float loaded to the required amount, the governor is differential in its action—that is to say, the difference between the inlet and outlet pressures is constant, thus enabling the pressure on the district governor to be reduced to any required extent below that at the works.

The differential governor of Mr. H. E. Jones is exhibited in the accompanying drawing, fig. 12. It consists of a cast-iron box, divided into two chambers, upper and lower, by a central diaphragm division-plate, on which is supported a vertical pipe; the diaphragm has slotted holes on its side near the top, which latter may be surmounted either by a flat plate or by an upright cone. If the former

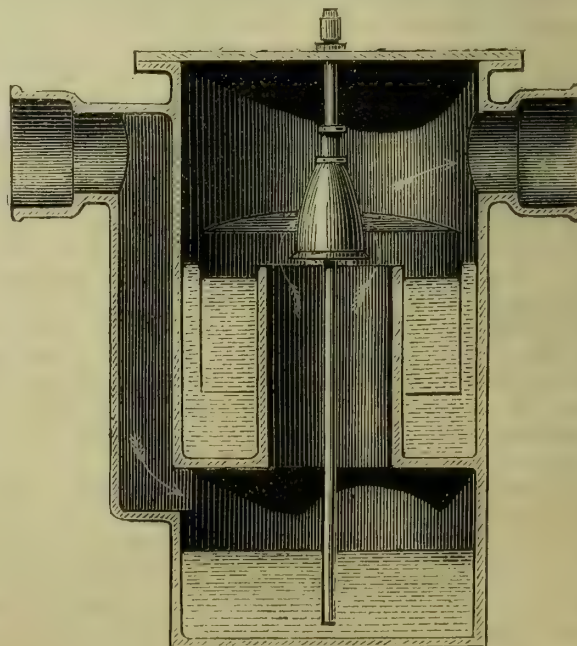


FIG. 12.

be used, a conical collar or ring is attached to the under side of the crown of the holder, and seats itself on the plate; but if a cone be employed, the ring is less in depth, and is made, as usual, to fit the



cone base. When the governor is fixed in the line of main, it has no communication with the atmosphere, for the small vertical pipe is intended only for the attachment of a syphon-pump, and is capped in the ordinary way.

The action of the apparatus is as follows:—The gasholder being weighted so as to require, say, 6-10ths of an inch pressure to raise it, the gas, on entering the bell, has first to overcome its resistance, and if the incoming pressure is less than 6-10ths, it is evident that the holder will not be raised from its seating, and therefore no gas can pass. If, however, the pressure exceeds the 6-10ths, the gasholder is lifted, but only such quantity of gas passes as is due to the pressure in excess of 6-10ths, for that pressure must of necessity be maintained underneath the bell in order to support it. Thus suppose the pressure on the inlet to be 10-10ths, then that on the outlet will be 4-10ths; on increasing the pressure on the inlet to 20-10ths, the outlet pressure becomes 14-10ths, and so on. Consequently the governor responds to changes in the initial pressure at the works during the hours of day and night.

The system of periodical district pressure taking, advocated by Mr. Warner, is eminently worthy of attention.\* It is only by having an intelligent knowledge of the varying pressures throughout a district that will enable a Manager to give an efficient and economical supply of gas. The pressure, as Mr. Warner aptly observes, is the pulse of the system, and an intimate acquaintance with this at all points, and during the different hours of consumption, is absolutely required to ensure satisfactory distribution.

(To be continued.)

## LIGHTING BY ELECTRICITY.

(Continued from page 49.)

The next invention which comes under our notice is a communication from "a foreigner residing abroad," and patented by Mr. E. A. King, in 1845. It will be seen that this inventor anticipated by many years the improvements that would be necessary in the apparatus for lighting by electricity before any general use could be made of it. The ideas of the patentee are clearly set forth in his specification, and, since his time, others have followed in the same track with a view to improvements, but no practical results have followed. Notwithstanding the lapse of years, and the efforts made

fully develop the voltaic arc, according to the power of the current generated, for he says:—

"The nature of this invention consists in the application of *continuous* metallic and carbon conductors, intensely heated by the passage of a current of electricity, to the purpose of illumination. The metal found to be the most advantageous to use for the purpose is that which, while it requires a very high temperature for its fusion, has but a feeble affinity for oxygen, and offers a great resistance to the passage of an electrical current. Platinum, though not so infusible as iridium, has but little affinity for oxygen, and offers a great resistance to the passage of the current; and as it is abundant, and easily worked into the requisite form, it appears to be preferable to any other metal. The platinum should be worked into those exceedingly thin sheets known as leaf platinum. This may be accomplished by the ordinary process of the goldbeater; but a more accurate method is to place a piece of platinum foil between two thick plates of rolled copper, and reduce the whole to a thin sheet by rolling, when, on separating the copper pieces, the platinum leaf will be found of uniform thickness in every part. In this way it may be obtained so thin that on holding it before a printed page the letters can be distinguished through it. A strip is to be cut from one of these sheets, of a width proportionate to the quantity of the current, which with Grove's cells, having the platinum plates 3 inches long and 2 inches wide, is about one-fourth of an inch, and of a length proportionate to the intensity, which, of course, varies with the number of cells.

"Great care must be taken to cut the platinum strips of an equal width throughout, and with a clean edge, as, if this is not carefully attended to, the strip will be unequally heated, and will be fused in one part before the other parts have obtained a sufficiently high temperature to produce a brilliant light. The platinum strip is now to be suspended between two forceps in an instrument made for the purpose, one form of which is shown in section in the drawing annexed, marked Fig. 10. A is a square brass bar, fixed into the wooden stand, C, having a binding screw, F, attached to its lower end. The two arms, E, D, are attached to sockets, which slide on this bar, so as to admit of their being placed at different distances from each other. They are both bent at right angles, as seen in the figure, and terminated by broad forceps tipped with platinum. These forceps are closed by the milled screws, H, I. The arm, E, has a rod, N, with a screw cut on it passing through it, and by means of the two nuts, B, B, working on this rod, the arm may be adjusted to any required height, and the distance between the forceps thus regulated. The rod passes through the stand and is attached to the binding screw, G. The socket is lined with ivory or some other non-conducting substance, so as to prevent any metallic communication between the arm, E, and the bar. S is the strip of platinum leaf, which is first clamped in the upper forceps. The arm, E, is now adjusted to any required height, and the lower forceps are closed, so as to clamp the lower end of the strip of platinum. It may

now be included in the battery circuit by attaching one of the wires to the binding screw at F, and the other to that at G. The current should be one of considerable intensity, and the distance between the forceps should be sufficient to prevent the platinum being fused. The distance may be lessened by raising the arm, E, and shortening the strip of platinum until it attains the highest temperature it will bear without fusing, or the same object may be attained by increasing the intensity of the current. The glass shade, R, which serves to screen the platinum from currents of air, dust, &c., may then be placed over the apparatus, as seen in the drawing.

"When carbon is used, it becomes necessary, on account of the affinity this substance has for oxygen at high temperature, to exclude from it air and moisture. To accomplish this in the most perfect manner it should be enclosed in a Torricellian vacuum. One form of the apparatus for this purpose is shown in section in the drawing annexed, and marked fig. 11; a is a glass tube similar to those used for barometers, except that it has its upper end enlarged into a cylindrical bulb and a stout platinum wire sealed in at the top. A binding screw is fixed on the top of the wire, whose lower end screws in the iron piece, d. To this piece the forceps, f, are attached, and it is connected with a similar piece at h by the porcelain rod, i. The forceps, g, are attached to h, and clamp the lower end of the carbon piece, c, which has its upper end held by those at f; n is a copper wire, which is fixed into the piece at h, and extends to the bottom of the tube; the tube is filled with mercury in the same manner as a barometer, the usual precautions being taken to expel the air; its length, independent of the bulb, should be about 30 inches, so that when it is inserted in a cup of mercury a vacuum will be formed in the bulb. The instrument is included in the electrical circuit by connecting one of the wires from the magnetic or voltaic battery with the binding screw fixed on the wire, e, and the other with a wire which passes into the mercury in the cup at the bottom of the tube. The circuit is thus completed by the column of mercury, and, when it is depressed in the tube by the formation of vapour of mercury, the connection is preserved by the

copper wire, n. That form of carbon found on the interior of coal gas-retorts which have long been used is well suited for this purpose, and may be worked into the form of either small pencils or thin plates by the aid of the saw and file. As carbon will bear a very high temperature without fusion or volatilization, it may be employed when a very intense light is required. When an intermittent light, for the use of lighthouses or for other purposes, is required, it may be obtained by breaking the circuit at intervals by clock-work. To effect this, one of the wires from the magnetic or voltaic battery is connected with a spring, which is made to press on the circumference of a metallic wheel fixed on one of the arbors of the clock, having certain portions of its surface cut away, so as to break and close the circuit at any required intervals. When the apparatus is suitably sealed it may be applied to submarine lighting, and also to the illumination of places where it is necessary to guard against the inflammation of highly combustible or explosive compounds, as in powder magazines, mines, &c."

The last paragraph of this specification refers to an arrangement

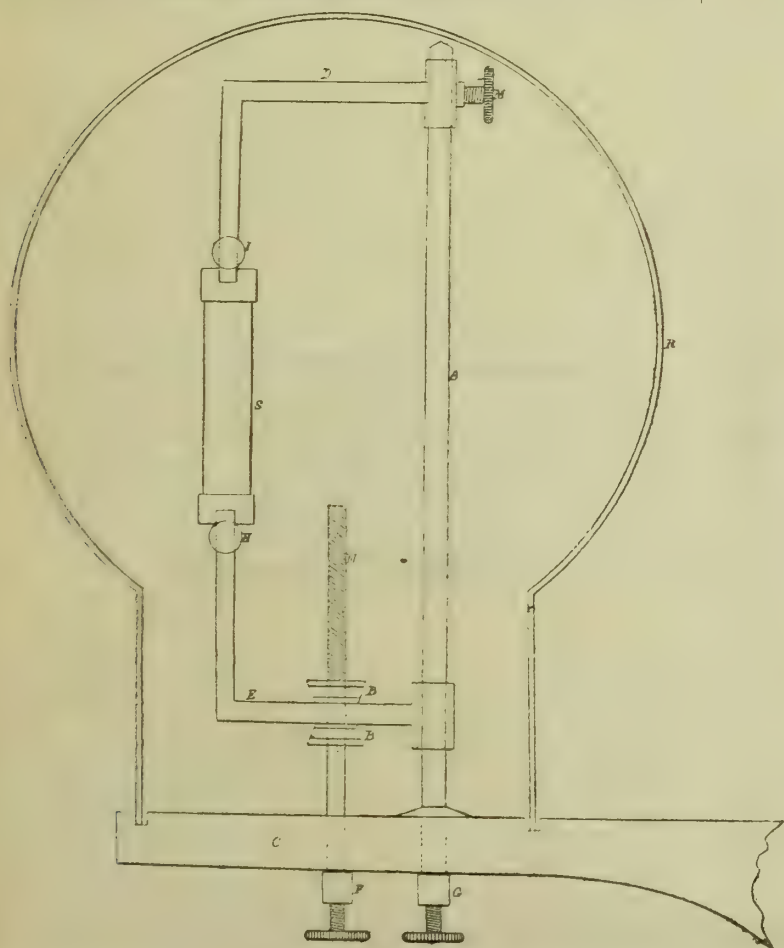


FIG. 10.

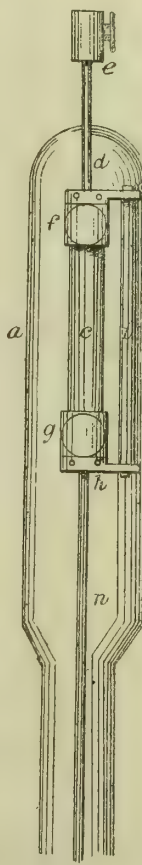


FIG. 11.

during the interval, one great difficulty—viz., the divisibility of the electric current emanating from the same source, is still in the distance; and, as regards its distribution, for the purpose of lighting in competition with gas, is as far off as in the days of King's correspondent. This invention, to which we now refer, was not intended to supersede the regulator, such as now forms a part of the electric lamp, there being none of any merit then in use, but was clearly intended to get rid of the difficulty that brought the regulator into existence—that is the keeping the carbons at such a distance as to

\* The system described by Mr. Warner has been so recently given in these columns (proceedings of British Association of Gas Managers, JOURNAL OF GAS LIGHTING, Vol. xxx., p. 96) that we need not further allude to it here. In the "Treatise," when published as a separate work, full details of the plan will be given.



for producing more than one light or luminous point, by means of a single current, from one source—at once the great desideratum and the great difficulty. Were it not for the flippant manner in which statements concerning this matter are made, and assurances are given of its near accomplishment, we should pass it by without remark, knowing that all those who have paid any attention to the progress of electric lighting are well aware that it is as far from being realized, by simple means, now as when the paragraph was penned. The inventor says:—

“When a current is of sufficient intensity, two or more lights may be made in the same circuit, care being taken to regulate the power by increasing or diminishing the number of armatures, if a magneto-electric machine is the source of electricity, or the number of cells if a voltaic battery be used, so that the united resistance of the strips of platinum or carbon shall be sufficient to prevent the passage of such a quantity of electricity as would destroy them.”

The document from which the above quotation is derived is, as we have before seen, dated 1845. The following may be considered to date from December, 1877:—The Lyons Railway Station is now lighted by electric lamps, and the system adopted is one devised by M. Lontain. He proceeds by sending a current, generated by a powerful dynamo-electric machine, to an electro-magnetic arrangement so contrived as to distribute electricity to the different points of light; not *divide* the current first generated into as many streams as there are lamps, but rather by the velocity of its own revolving parts, and the influence received from the first engine, to bring into action as many electro-magnets, and, thereby, the induction of as many currents as are represented by one-third of the number of lights required, it being asserted that each induced current is capable of actuating three such lamps as those in use at that place—twenty-eight being the number now supplied. The first attempt at division was simple, but defective; and so have been all the attempts of those who have laboured to develop the same idea. The second system, however applicable it might be to the purpose for which it is applied, cannot be pronounced a *simple* method, even if we admit it to be a division at all, in the sense in which it was first understood. Patents are accumulating for inventions for the production of electricity, and decided improvements are apparent. The lamps also—that is, their regulators—are attaining a state of accuracy that renders it easy to procure a powerful light; but the means for the application of electricity to general lighting are, for anything we now know of, as far off as ever.

(To be continued.)

**BIRMINGHAM GAS ARBITRATION.**—The *Birmingham Daily Post* says this arbitration was resumed on the 27th ult., before Sir Henry Hunt, umpire, and Mr. Hawksley and Mr. Bramwell, arbitrators respectively for the Corporation and the Local Boards. The Court adjourned on the 29th, and sat again from the 1st to the 5th instant. The whole time was occupied in hearing the case for the Corporation, who submitted a statement showing the profits accruing from the portion of the undertaking comprised in the West Bromwich district, on which their witnesses—Mr. Spice, C.E.; Mr. Price Williams, C.E.; Dr. Pole, C.E.; Mr. Law, C.E.; Mr. Charles Hawksley, C.E.; and Mr. George Livesey, C.E.—based their valuation. Mr. Chamberlain, M.P., and the Town Clerk were present during the whole time on behalf of the Corporation, and the former gave evidence on the 5th instant. His cross-examination was not concluded when the Court rose, and an adjournment has been arranged till the 1st of February, when the Court will sit to the 8th of February inclusive. Mr. Michael and Mr. Will appeared as counsel for the Corporation, while Mr. Rodwell, Q.C., Mr. Matthews, Q.C. (who took the place of Mr. Tesiger, recently appointed one of the Lords Justices of Appeal), Mr. Webster, Mr. Pembroke Stephens, Mr. Young, and Mr. Underhill appeared for the various Local Boards.

**PRICE OF GAS IN LANCASHIRE AND YORKSHIRE.**—At a meeting of the Ratepayers of Little Lever, near Bolton, on the 27th ult., Mr. Thomas Bramwell, a member of the Local Board, read the following extracts from a return which he had received relative to the prices paid for gas in certain towns in Lancashire and Yorkshire:—

Town.	Population.	Price per 1000 Feet.
Radcliffe . . . . .	11,446 . . .	5s. 3d.
Fleetwood . . . . .	6,500 . . .	5s.
Hyde . . . . .	16,000 . . .	4s. 6d.
Littleborough . . . . .	8,500 . . .	3s. 9d. to 5s.
Over Darwen . . . . .	26,000 . . .	4s. to 4s. 3d.
Padiham . . . . .	9,000 . . .	3s. 8d. to 4s. 9d.
Dukinfield . . . . .	18,000 . . .	3s. 2d. to 4s. 2d.
Denton . . . . .	6,000 . . .	3s. 2d. to 4s. 2d.
Todmorden . . . . .	22,000 . . .	4s. 8d.
Altrincham . . . . .	10,000 . . .	4s. 6d., less discount.
Birkdale . . . . .	6,500 . . .	4s.
Ince-in-Makerfield . . . . .	14,000 . . .	3s. 10d.
Ormskirk . . . . .	6,127 . . .	5s. 6d.
Milnrow . . . . .	6,700 . . .	3s. 9d.
Whitworth . . . . .	10,700 . . .	4s. 3d.
Worsley . . . . .	7,000 . . .	14s. 6d. per 1000 hours.
Bacup . . . . .	28,300 . . .	4s. 8d., less discount.
Openshaw . . . . .	13,500 . . .	3s. 10d. to 4s.
Moss Side . . . . .	12,000 . . .	4s. 2d.
Rusholme . . . . .	9,000 . . .	4s. 4d.
Sale . . . . .	6,600 . . .	4s.
Swinton and Pendlebury . . . . .	20,000 . . .	4s. 8d.
Stalybridge . . . . .	2,300 . . .	3s. 11d. to 4s. 6d.
Great Harwood . . . . .	5,500 . . .	4s. 6d.
Barton, Eccles, Winton, & Mouton . . . . .	20,000 . . .	4s. 8d.
Prescot . . . . .	5,990 . . .	5s. 3d.
Heaton Norris . . . . .	5,000 . . .	4s. to 4s. 8d.
Loveshulme . . . . .	2,500 . . .	4s. 2d.
Heywood . . . . .	23,000 . . .	4s. 2d.
Leigh . . . . .	20,000 . . .	5s. 6d., less discount.
Atherton . . . . .	10,000 . . .	4s. 3d. to 4s. 7d.
Chorley . . . . .	16,864 . . .	3s. 6d., 3s. 9d., and 4s.
Bowdon . . . . .	2,200 . . .	4s. 6d., less discount.
Garston . . . . .	8,000 . . .	4s.
Haydock . . . . .	5,285 . . .	4s. to 4s. 6d.

# Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

## A SIMPLE METHOD OF CHARGING RETORTS.

SIR,—The drawing and charging of retorts by machinery is a subject that has taken the attention of many gas managers during the last ten or twelve years, and no doubt the machinery that has been brought into use has proved a success in many large gas-works. But, unfortunately, it is of no use for small works, such as I and hundreds of other managers have the control of. Now, Sir, I contend that if the saving of labour and gas is worth considering in a large work, it is proportionately so in a small one; and I am sure if some of our great gas engineers would bring out some simple machine for works making from 3 to 30 millions per annum, they would be well repaid for the trouble.

I have been recommended by many to adopt the hand scoop, but the difficulty has been the necessity of employing three men on a shift to work it, and again I object to the picking up of the charge so many times. In the first place, it is picked up in the coal stores, then thrown down upon the retort-house floor, picked up again to load the scoop, and then lifted into the retorts.

I enclose pencil sketch of a simple arrangement that I have adopted during the last four months for charging, which can be worked either by one, two, or three men. And if you would kindly publish it in your JOURNAL no doubt it would prove a great benefit to many gas companies and stokers.

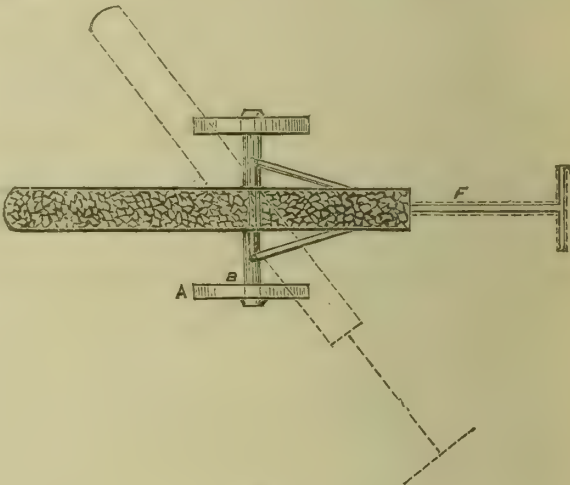


Fig. 1.

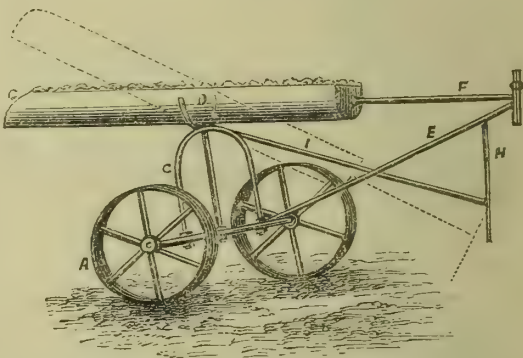


Fig. 2.

Figs. 1 and 2 are a plan and elevation of hand scoop and truck. A A are two cast-iron wheels, 2 feet diameter; B, 2½-inch by ½-inch axle; C, ¾-inch round iron bow stay; D, half-round swivel stay secured with pin through the bow stay and axle; E, truck handle; F, scoop handle; G is the scoop; H, truck leg; I is an iron stay which supports the bow stay, truck handle, and leg. It will be noticed that the two handles are of the same size, and one upon the other, and secured with slip ring or hook, when being loaded or pushed about. The dotted lines show that the scoop can be lifted up or down, and to the right or left angles. When the retorts are ready for charging, the machine is run parallel with the bed, the wheels being 1 foot 6 inches on the off side of the retort, the scoop is then turned upon the swivel stay, and lifted or lowered until it is lodged upon the mouthpiece, and then lifted from the truck and pushed into the retort. It is then turned over, drawn out, and lowered upon the truck, which stands in the right position for receiving it. I need not refer to the many advantages there are in connection with this simple arrangement, as it will be readily seen by any gas manager. My stokers are very pleased with it, and would be sorry to take to the old system of charging by the hand shovel.

Gas-Works, Hincley, Jan. 4, 1878.

JOHN SURL.

P.S.—I keep two scoops and trucks of different heights, one for the top, the other for the bottom retorts, and the one is being loaded with coals while the other is being unloaded.

## PURIFICATION OF GAS.

SIR,—Your editorial remarks on the case of *Patterson v. The Gas-light and Coke Company* open up a view that is quite new to me. It appears that Mr. Patterson has another patent, of date 1873, for the purification of gas by prepared ammoniacal liquor.

In 1874 or 1875 I wrote several letters, which you were kind enough



to insert in the JOURNAL, proposing the same thing. Had I known that the idea had been already patented, I should have said so; and although I have been forestalled, I am pleased to think I am not alone in the views I held, and still hold, and now more firmly than then; because I have now ample proof, from the workings of my combined washer and scrubber, that the whole of the ammonia can be removed from the gas. This has been proved by several of those machines erected at different works, with the one uniform result of a total removal of the ammonia.

At one of our London works I have seen a stream of gas issuing from the outlet of one of these machines, bubbling through a reddened solution of litmus, that remained without discoloration for several days; a slip of turmeric paper also remaining in the stream of gas unchanged.

I have held for some years that the imperfect results obtained from washers and scrubbers were due to defective construction—namely, in not ensuring a finely-divided state of the gas, and an intimate contact with the purifying material; hence my design of passing the gas through the fibres of a revolving and constantly-wetted brush. From this step, now accomplished, I have no doubt that, by properly prepared liquor, as indicated in my former letters, we can, by a series of those machines, remove every impurity; because ammonia can be made to remove all the other impurities which the gas contains.

I am, moreover, of opinion that this is the good to which we are tending—namely, the purification of gas in closed vessels by operating on the ammonia which the gas itself will furnish, and that the operation will be perfectly innoxious, will cost but a mere trifle for labour, will be conducted in one-fourth of the space hitherto required for scrubbers and purifiers, and at less than one-half the previous cost for apparatus, while the operation may be carried on anywhere without nuisance, even in the heart of a town.

But if we are to be met by the impediment of another patent, query, will the progress of improvement not be retarded? Few companies will be willing to risk the litigation and worry, expense, and questionable honour that have been attached to the above-mentioned case. Some company may, indeed, now be experimenting in that direction, and on the result of the Lords decision may be advised to resist.

This, to my mind, would be most undesirable; and I would suggest for the consideration of any who may wish to improve their process, whether it would not be well to, at once and for all, purchase up any remaining patent rights Mr. Patterson may possess, so that their chemists and engineers may be free to act with their full force, without the apprehension of further litigation.

The companies are now victorious. Like generous victors let them now hold out the olive-branch. Let Mr. Patterson meet them in a liberal spirit, and we may arrive at an amicable peace that will harmonise all parties, sink the past in oblivion, and begin a new race that I am certain will end in every way beneficial to the gas companies.

GEORGE ANDERSON.

35a, Great George Street, S.W., Jan. 11, 1878.

#### CORRECTIONS.

SIR,—With all deference to Dr. Phelps, he is wrong in his letter of last week. The discharge of gas is as the square root of the pressure, and not, as he states, in the inverse proportion of the square root of the pressure.

I cannot agree that there is any inaccuracy in the expression: "The pressure of gas in the mains varies," &c. There is an actual pressure in the mains due to the weight of the gasholders.

Jan. 9, 1878.

WRITER OF THE "TREATISE" ARTICLE.

#### DUBLIN GAS AND IMPROVEMENT BILLS.

SIR,—I observe poor Mr. Cleminshaw has made another application to the Dublin Corporation for payment of his account. As you may have something to say on the subject in your next, I send a cutting from a Dublin paper, anent another "Bill" about which similar difficulties have arisen.

In a light-hearted spirit our Corporation promote Bills. Not waiting for a settlement with their creditors on the Gas Bill, they took up a grand Improvement Scheme, which broke down at the Standing Orders stage, with a liability of £1506 incurred.

The first named on the "official list" has issued a summons and plaint, which will probably run through all the courses of the Cleminshaw suit; but by that time the Corporation will have been deeply engaged on another Bill.

The respectable citizens of Dublin view with disgust those proceedings of their so-called "representatives."

Dublin, Jan. 6, 1878.

J. McEvoy.

#### OUR LAST "IMPROVEMENT" BILL. TO THE EDITOR OF THE "IRISH BUILDER."

Sir,—What have you done to the Corporation that your name does not appear in the list of creditors now claiming payment of their "little bills" for work and labour in promoting by "Bill" the improvement of the city? The following is the official list:—

William Smith, London—taking references . . .	£165	0	0
Forster and Co.—lithographing . . .	39	15	0
Hodges, Foster, and Figgis—do. . . . .	9	10	0
Tudor and Smith—scrivency. . . . .	6	11	7½
Parke Neville—expenses . . . . .	4	13	0
R. W. Walsh—preparing plans . . . . .	26	5	0
Dollard and Co.—printing . . . . .	210	13	2
Freeman's Journal—advertisements . . .	123	3	0
Daily Express . . . . .	148	15	0
Mail . . . . .	155	13	6
Nation . . . . .	16	16	0
Irish Times . . . . .	135	12	0
Saunders . . . . .	140	0	0
Farmers' Gazette . . . . .	13	10	0
Muggeridge and Badham . . . . .	310	16	8

£1506 13 11½

Given, a Bill thrown out on Standing Orders to cost £1506, how much for one passed into an Act? Considerate, was it not? to give our Farmers notice through their own Gazette, and our Irish Nation through its own organ; but why pass over the Irish Builder, and our martyred colleague, the Irishman?

#### AITKEN AND YOUNG'S PROCESS.

SIR,—If any Gas Company can, by the employment of Aitken and Young's process, supply a richer gas at a lower price than can be furnished by the ordinary rough-and-ready process, we shall be very glad to see it."

These words occur in the "Circular to Gas Companies," in your issue of the 25th ult., and they seem to me to be framed in a manner that will enable all to echo the words, "So shall we." But I fear that the hypothetical two first words of your sentence are serious stumbling-blocks, and the removal of these, that the word "A" might be substituted as a beginning, is delayed indefinitely.

When I made a suggestion, relative to this subject, in your issue of the 10th of July last, it did not occur to me that Messrs. Aitken and Young might soon give an opportunity for the remarks I have just made; but I will show shortly my reasons for coming to the conclusion I have done.

Gas manufacturers have, within the past few years, had two schemes submitted to them for the more economical manufacture of gas—viz., Mr. Malam's process, and that of Messrs. Aitken and Young. The mode of procedure, the volume of gas per ton realized, and the description of the secondary products obtained, are totally different, in these processes, the one from the other. In Mr. Malam's process there was a large volume of gas obtained per ton of coal, and the destructive distillation was carried on so perfectly that, besides the gas, the only residue that may be said to have remained from the "black diamonds," was a quantity of dry "lampblack," choking up mains, condensers, connections, and even passing into the station-meter. That Mr. Malam came to patent his process was probably owing to his works having become dilapidated, and possibly not working very satisfactorily. He built a new bench of retorts, and finding that by his high heats he obtained a large production of gas per ton of coal, and being annoyed with choked ascension-pipes, he devised and patented his "jacket," surrounding the mouthpiece and ascension-pipes, and containing water to keep the pipes cool and prevent chokes. But not being content with this, he added the incandescent coke at the back end of the retort, through which the gas, generated within the retort, had to pass before reaching the outlet. This led to further decomposition, so that, although there was an extra large yield, the whole volume of gas given off was bound to be less luminous, so that the advantages he had gained before applying this new form were destroyed.

In Messrs. Aitken and Young's process, however, high heats are not desired, and, while using an inferior coal, they do not obtain a large yield of gas, but by a second process try and pick up the naphthas from the tar, so as to improve the illuminating power of the gas produced by the first process. Still they seem not to be quite happy over the results of their efforts; and, at the best, the process appears to me to be very like a milkmaid going on separate occasions to skim the cream from off her milk, so as to get better results, instead of waiting until a proper time, and getting it all by one effort.

We have a few hints of what Messrs. Aitken and Young wish to accomplish by their process, in the report of the proceedings of the West of Scotland Association of Gas Managers, published in your issue of the 13th of November last, p. 762; and as their desire is a very laudable one—viz., to take out as large a proportion of the naphthas as possible from the tar—I will quote a sentence or two from the speakers at that meeting, and compare them with a statement of what has fallen within my own experience bearing on the subject.

1. Mr. Aitken remarks that, "No doubt the tars got by the new way of working do not contain the naphthas; but, on the other hand, they can be sold as once-run tar, and the market price of this article is, I believe, higher at present than crude tars, and there is a large market for them."

2. Dr. Wallace says: "In regard to this process, if the object of the gas manager was to make tar rich in naphtha, this process would be the worst; but, if he wants to make gas, and considers tar a secondary product—as it has always been considered—then I think this process is an immense step in advance of anything we have had before." And again: "In the tar made at Hamilton, though the proportion of naphtha is less than in tar made in ordinary circumstances, yet there is something like half the quantity left. I shall not be content until I see a larger proportion of the naphtha taken out than has been the case hitherto."

3. Mr. Young, about the latter part of his remarks, says: "I believe that, with the most perfect instrument, so long as we use rich coals there will be left a surplus of the denser naphthas, because the rich gases are not able to take up those naphthas and hold them in suspension." He further observes: "There is no doubt that this process effects a considerable saving." And yet again: "It only requires a little time, perhaps, to develop the mechanical arrangements by which the most perfect results may be obtained."

On referring to the copy of a letter which is in my possession, and dated December, 1872, I find that from the mixture of coals I was then using, and charging each retort with 1½ cwt., I obtained 13,800 cubic feet per ton, and by putting 2 cwt. into each retort I obtained 13,500 feet per ton. Another letter, dated Jan. 2, 1873, shows me that the average production per ton for the month of December, 1872, was 13,327 cubic feet of gas, the quality was never under 28 candles, and the gas was permanent. So far as I can remember, my average production per ton for the winter six months was 13,300 cubic feet, and during the summer six months 11,600 cubic feet. I had been able to reduce the unaccounted-for gas in these works by about 2½ per cent. each year, and during the year quoted the leakage was also reduced 2½ per cent. over the previous year.

The coals used were from five different pits—four of them of a good quality, and one a splint coal; the process was the ordinary, by no means in perfect order. The tar from the hydraulic main I could never run into a tar-well, though only seven yards distant from the hydraulic main; but by erecting a cistern close up to the hydraulic, and allowing the tar to drop into it, and by keeping a small coke fire burning day and night under the cistern, the tar was made to flow through a stopcock on the side of the cistern into a barrel, which as often as it was filled was removed. Very frequently this was done without any bung being put into bung-hole, as the contents got so stiff as not to



require one, and the finger could be pushed amongst the pitch in the bung-hole, and be taken out quite clean. The tar from the condensers was thick, and the ammoniacal liquor flowed with the tar quite clean and separately, without having any inclination to mix, and without any oily appearance.

Now I assume from this that, by a well-regulated ordinary process, the quantity and quality of the gas to be taken from a mixture of coals can be so regulated by the proportions of the mixture and the heats of the retorts as to leave little, if any, naphtha in the tar; and that without any fuss, such as the working of another separate process on the works, whereby a large outlay of capital would be required, and with working expenses in fuel and labour for steam, and keeping a separate watchfulness over temperatures, which seem quite uncalled for. Besides, gas carburetted in the manner proposed would not be so permanent if required to stand some days in the holders, or to travel considerable distances through mains and services, as it is when distilled by a proper heat, once and for all, in the retort.

And now as regards the quotations from the report of the proceedings at the West of Scotland Association of Gas Managers meeting.

1. To Mr. Aitken's remark I can say that the tars in an ordinary process can be made to contain little or no naphthas, and that the advantage of the product being thus equal to once-run tar, and obtaining a higher price in the market than crude tars, will stand equally good on behalf of an ordinary process.

2. Dr. Wallace's remarks lead me to think that the new process has not yet been able to do anything equal to the ordinary process in reducing the quantity of the naphthas in the tar; therefore the new process is a very good and altogether very feasible way of enriching the tar—by low heats in the first process, and imperfect distillation in the second. The tar will remain a secondary product, unless we take after Mr. Malam's idea, and erect lampblack chambers in place of tar-wells. The tar at Hamilton having still one-half of the naphtha in it, the statement I give shows better working, and when the finger can be inserted into the bung-hole and come out clean, I have no doubt but that Messrs. Aitken and Young will be content with the proportion of naphthas taken out of the tar.

3. As to the remark of Mr. Young on the impossibility of taking out the denser naphthas, even with the most perfect instrument, my statement will show it can be, and has been, done. The considerable saving he speaks of should be defined, and the "perhaps," in the last sentence quoted, is, I think, the only word that makes the clause correct. "Bosh" is not exactly the word I would like to use for the remainder, only I should like to know where there is a gas manager, with time and the means, that will not make his gas-works very near to achieving "the most perfect results."

I should like to see the statement describing the value of saving, after one year's working of the Aitken and Young process, as compared with the ordinary process, and, of course, I would require to see the gas-works that the process improved upon.

Now, Sir, I conclude that Mr. Malam's gas-works were ripe for the improvements he made upon them, and that the Company are reaping the benefit; also I conclude that the Hamilton Gas-Works were ripe for improvements, by additional condensers, &c., and I have no doubt that the Corporation are receiving the benefit. And as between the Malam or Aitken and Young process, I fancy the ordinary, which you term the "rough-and-ready" process, will yet have a considerable time to wait for the "development of the mechanical arrangements" referred to, and the accompanying "most perfect results."

WILLIAM KEY.

Tradeston Gas-Works, Glasgow, Jan. 4, 1878.

SHARE CERTIFICATES.—A correspondent, "J. N.," says: "We have several shareholders who have lost their share certificates, and require new ones to be issued in place of the lost scrip. The Directors will require an indemnification before issuing them. Does the said indemnification require to bear a stamp for the nominal value of such shares, or will it do without any stamp at all, on being signed by the Shareholder, and duly witnessed?" By the Companies Clauses Act, 1845, sec. 11, it is provided that any holder of shares in a company can demand a certificate of proprietorship, under the corporate seal, on payment of a sum not exceeding half-a-crown; and by sec. 13 it is enacted that "if such certificate be lost or destroyed, then, upon proof thereof to the satisfaction of the Directors, a similar certificate shall be given to the party entitled to the certificate so lost or destroyed," a similar fee being payable. The Directors are not entitled to ask for any indemnity, nor do they require any, nor does the substituted scrip require any stamp other than that of the seal of the Company.

## Parliamentary Intelligence.

### GAS AND WATER BILLS, 1878.

The following memorials, complaining of non-compliance with the Standing Orders, were deposited in the Private Bill Office on or before the 9th inst.:

- Cheltenham Water Bill, from Stephen George Millen.
- Nottingham Improvement (Gas and Water) Bill, from Charles Rogers and others.
- Cheltenham Corporation Water Bill, from George John Kirby and Charles C. Burke.
- Metropolis Water Supply Bill, from (1) East London Water-Works and Grand Junction Water-Works Companies; (2) Kent Water-Works and other Companies; (3) West Middlesex Water-Works and New River Water-Works Companies.

GAS EXPLOSION AT SWINTON.—Early on Saturday morning, Jan. 5, a serious explosion of gas occurred on the premises of William Brown, boot and shoe maker, Moorside, Swinton. A large quantity of gas appears to have gathered between the ceiling and bed-room floor, and in order to discover where the leakage was, Mr. Brown incautiously applied a light to the ceiling above the parlour chandelier. The gas instantly exploded, throwing Mr. Brown some distance, and setting fire to his hair and clothes, burnt him very seriously in the face, neck, and hands. The building was cracked from the scullery to the roof. The glass in most of the windows was forced out, and the furniture and stock in the shop sent flying in all directions. So great was the force of the explosion, that it was distinctly heard at the distance of a mile. Fortunately, no one was fatally injured.

## Legal Intelligence.

### GLOSSOP PETTY SESSIONS.—MONDAY, DEC. 31, 1877.

(Before Messrs. SHEPLEY and BUCKLEY.)

ACTION TO RECOVER COSTS OF REPAIRING ROADS AFTER MAIN-LAYING.

The Glossop Gas Company were sued by the Glossop Corporation to recover the sum of £47 13s. 6d. for the repair of a road at Hadfield, which the Company had opened for the laying of mains, and which it was alleged they had left in an incomplete and imperfect state, and the Corporation had to make it good.

Mr. ELLISON, town clerk, appeared for the Corporation, and Mr. BARKER, barrister, Sheffield, appeared for the defendants. Mr. HIBBERT, of Hyde, acted as the legal adviser to the Magistrates.

Mr. ELLISON, in opening the case, said he had to apply for a certain sum of money from the Glossop Gas Company, for doing some repairs to a road in Hadfield which the Company had neglected to do. Some few years ago the Corporation adopted the Local Government Act, and since then they had become surveyors of the highways. The Gas Company had authority to take up the streets, but before doing so they should give the Corporation notice. They, however, did not do so in this instance. For the purpose of lighting Hadfield they had a lot of road broken up, and according to their Act they should have made the road good, but they did not do so, and the summons was to recover the amount expended in doing what the Company had neglected to do. The work was not completed before the 6th of July last, and the Corporation were therefore clearly within the six months specified in the Act.

Mr. BARKER said that, in order to save the time of the Court, he would state his objections to the case proceeding. In the first place, the Corporation had no right to demand any sum; it was for the magistrates to assess it. Then the Company altogether denied the delay, and if that could be proved, the Magistrates had no jurisdiction in the matter. The 153rd section of the Companies Clauses Consolidation Act, 1845, enacted that "No person shall be liable to the payment of any penalty or forfeiture imposed by virtue of this or the special Act, or any Act incorporated therewith, for any offence made cognizable before a Justice unless the complaint respecting such offences shall have been made before such Justice within six months next after the commission of such offence." If the Magistrates, therefore, made an order in this case, the Company would appeal to a superior Court.

Mr. HIBBERT said he thought the case had better proceed, for if there was no order made there would be nothing to appeal against.

Mr. Ramsbottom having proved serving the notice on the Gas Company, signed by the Town Clerk,

Mr. James Nuttall, Surveyor of Highways, was called and examined by Mr. ELLISON. He said: I have had control of the streets under the Urban Sanitary Authority for eight years, acting for the Corporation. In the month of September, 1876, the defendants broke up Hadfield Road for the purpose of laying down larger gas-mains, and the work continued into November. There was a continuous line of 272 yards on the pavement, and 870 on the macadam; and the depth of the trenches on the footpath was between 3 and 4 feet, and on the macadam 18 or 20 inches. The width varied on the pavement 3 to 4 feet, and 2 feet on the macadam. I had no intimation from the Company that they were going to do the work; they did it in their own way, and I did not interfere. Before they commenced the work the pavement was in good condition, and the top and bottom part of the macadam also; but there was a short distance between, not so good. After the mains were laid, the subsoil and the macadam were put in together instead of separate, and the work was consequently left in an imperfect state. People spoke to me frequently about it, and in February I began to do something. There had been a delay from November to the 9th of February, when we began to take off the ridge; we repaired it and made it good, and completed it about the 6th of July, 1877. We did not work continuously, as we had to wait for its settling, which accounted for the delay. We repaired 860 yards of macadamized road, and 272 yards of pavement. The pavement was done by piece-work, and the macadam by day-work. The number of days engaged on it was 143½, at 3s. per day, amounting to £21 10s. 6d., which was paid by the Corporation. That amount was for the macadam road. Then I had a horse and cart 10 days, at 7s. 6d. per day; broken stone, 50 loads, at 3s. 4d. a load, £8 6s. 8d. making the total of the items mentioned, £33 12s. 2d. For the pavement we have charged 8d. per yard, £5 13s. 4d.; horse and cart, 2½ days, 17s.; 12 loads of gravel riddled, £1 10s.; two men 3½ days riddling, £1 1s.; total for pavement, £9 1s. 4d. I have charged £3 for superintending the work. My wages are 30s. a week. I made a demand in July for £65, but I did not make a demand before the 14th of July for any money for the job. When the defendants left the road there was a ridge five or six inches in a very rough state.

Cross-examined by Mr. BARKER: We first of all charged 4d. per yard more, which was to allow for subsidence. Whatever care we take we cannot avoid a subsidence. I was constantly about the roads, and saw them doing the work, but I did not offer any objection. As the work proceeded I saw it was being done badly, and still I did not object to it. I cannot say when I first complained to the Company; when the foreman was working on the job I complained to him. On the 21st of June I wrote a letter to the Manager, but it was for Norfolk Street, and not for Hadfield. It had been customary for us to repair the roads after the Company, and charge them for so doing. I have no feeling against any member of the Gas Company. I have charged £3 for my services. I may have neglected some part of the Corporation work. I saw at the time that the work was not properly done. I clearly saw they had not restored the roads last November.

Re-examined by Mr. ELLISON: I did not know what rights we had. I never said anything to the Company about the mode of doing the work.

Benjamin Walsh said he remembered the road being taken up, and he saw it after it had been filled in, and it was left in a very unfit state, and was an annoyance to the public. It was imperfectly filled in, and stood of a ridge, and there were a lot of loose stones about.

Mr. SHEPLEY said the case had better be adjourned, as he was obliged to leave.

Mr. BARKER said it would be very expensive if he had to come again, and suggested that an order be made for £40, with leave to appeal given to the Court of Queen's Bench to quash the proceedings, as the action had not been brought within the six months prescribed by the Act.

After some further conversation it was agreed that an order should be made for £42 13s. 6d., and the Company to have leave to appeal.

On a subsequent day the Company served the notices of appeal upon the Magistrates giving the bond required in such cases.

### DARWEN PETTY SESSIONS.—THURSDAY, JAN. 3.

(Before Messrs. ECCLES and GRAHAM.)

CONVICTION FOR BREACH OF THE WATER-WORKS CLAUSES ACT, 1863.

Mr. Christopher Leach, plumber, &c., was summoned by the Local Board of Darwen for a breach of the Water-Works Clauses Act, 1863.

Mr. RADCLIFFE appeared to prosecute; Mr. BACKHOUSE appeared for the defendant.



The case first came before the Bench on Dec. 13, when Mr. Radcliffe stated that the proceedings were taken under the 19th section of the Act, which was as follows:—"It shall not be lawful for the owner or occupier of any premises supplied with water by the undertakers, or any consumer of the water of the undertakers, or any other person, to affix, or cause or permit to be affixed, any pipe or apparatus to a pipe belonging to the undertakers, or to a communication or service-pipe belonging to or used by such owner, occupier, consumer, or other person, or to make any alteration in any such communication or service-pipe, or in any apparatus connected therewith without the consent in every such case of the undertakers, and if any person acts in any respect in contravention of the provisions of the present section, he shall for every such offence be liable to a penalty not exceeding £5, without prejudice to the right of the undertakers to recover damages from him in respect of any injury done to their property, and without prejudice to their right to recover from him the value of any water wasted, misused, or unduly consumed."

The water-works at Darwen were the property of the Local Board, and it would be proved that Mr. Leach was executing the plumbers work of four houses in Primrose Hill, and also the plumbers work of three houses at Ashleigh. In August he gave notice to the Local Board that he wanted the water turned off, in order that he might connect the pipes to the main. The Water Bailiff went to the place for the purpose of turning off the water, but on finding that the pipes intended to be laid were only 6lbs. to the yard, instead of 7lbs., he refused to do so. In the middle of September it was discovered that Mr. Leach had caused the pipe to be fixed to the main, and that all the four houses were being supplied with water, the same course having been adopted at the houses at Ashleigh.

Mr. T. Duxbury, the Manager of the Water-Works; Mr. Marsden, the Water Bailiff; and Mr. Taylor, a Clerk in the Water-Works office, having given evidence in support of the opening statement, the case was adjourned.

At the sitting of the Court this day the same witnesses were recalled and further examined.

Mr. BACKHOUSE said his defence was a distinct denial of the statements of the complainants. He should show that his client connected the piping with the consent of the Board, that the water was turned off by the servants of the Board, and that it was turned off after notice had been given to the Board, and when his client had a perfect right to connect the pipes.

John Harwood, who in August last was a labourer in the employ of the Local Board, said he knew the property in Primrose Hill. He remembered the pipes being connected. He was sent to the place by a person in the office, to turn off the water. That person had sent him to turn off water often before. Witness turned off the water by instructions from Mr. Taylor.

W. Baron deposed that he went with Harwood to turn off the water. He had turned off water scores of times.

Mr. James Leach, defendant's nephew, said he was the person who gave notice that Mr. Leach wanted the water turned off. He saw Baron and Harwood in the yard. They went to the place and turned the water off in his presence. He never saw Marsden about the matter. Marsden never told him that he would not turn off the water.

This closed the first case, and the Bench decided to reserve their decision until they had heard the next case.

Mr. RADCLIFFE said the second charge was for connecting the pipes of three houses at Ashleigh, belonging to Messrs. Cocker and Knowles. It was stated for the prosecution that no notice was given to the Board about coupling the pipes, and in September they were found to have been connected.

Mr. BACKHOUSE said that Messrs. Cocker and Knowles, as the owners, should have been summoned. Harwood, who was a servant of the Board, to whom notice was given, authorized Leach to turn on the water, as he could not go to the place at the time he was wanted. This he had done often. He told Marsden that he had instructed Leach to couple the pipes.

THE BENCH inflicted a fine of 40s. and costs in each case.

Mr. BACKHOUSE applied for a case, and it was granted.

### GREENWICH POLICE COURT.—TUESDAY, JAN. 8. (Before Mr. BALGUY.)

#### CONVICTION OF STOKERS FOR NEGLECTING WORK.

John Thompson, stoker, George Steele, scoop driver, and John Butler, stoker, appeared to summonses under the Employers and Workmen Act, charging them with absenting themselves from work without leave or notice, and for which a claim was made upon each for £1 compensation. The defendants had been in the employ of the Phoenix Gas Company at the works at Greenwich, and they formed three of a gang whose duty was to work during the night of Sunday, the 23rd ult. The three defendants, who lived in one house at Deptford, failed to attend at six o'clock in the evening, and other men had to be sought for to take their places. This caused a delay of an hour, the retorts being left empty, more fuel being burnt, and the neighbouring consumers being liable to have been put to inconvenience.

Mr. Rotten, foreman of works, proved that printed notices were posted at all parts of the works that a week's notice was required on both sides as to discharging or leaving, and Mr. Bates, the Engineer at the works, said he had most moderately estimated that the loss sustained by defendants absence was £3. The defendants, he said, were good workmen, earning 38s. per week, but since November last had twice similarly misconducted themselves, of which no notice had been taken. The Company regretted having to take the present proceedings, and although the summonses must be pressed, he would promise, if they made amends, to take them back again. That morning there were seventeen men absent, a state of things which frequently happened after receiving pay or at holiday time.

Thompson and Steele pleaded guilty, complaining that there was no holiday allowed, and they had to take one; and Butler excused himself by saying he was unwell, suffering from pain in the back, but he offered no such excuse some days afterwards, when he went to the works and was discharged.

Mr. BALGUY said there were hundreds and thousands of men in the mining districts who would be glad to have the employment and wages the defendants had deprived themselves of. In making the orders asked for, to pay £1 each to the Company and 2s. cost of each summons, he advised them to see the Engineer, and again go to work.

PURE WATER.—In the last session of the Deutsche Gesellschaft für Öffentliche Gesundheitspflege, Dr. Falk described a new method of testing the purity of drinking water by electrical experiment. From researches carried out in the laboratory of the School of Artillery in Berlin, it appears that the conductive properties of water for the electric current vary rapidly according to its degree of purity, the resistance decreasing with the purity of the water. It is possible, in this manner, to detect with great ease the presence of small quantities of organic matter in water.—*Nature.*

## Miscellaneous News.

### METROPOLIS GAS SUPPLY.

ABSTRACT OF REPORT OF CHIEF GAS EXAMINER.—The following are some of the particulars contained in the Report of Dr. Williamson, F.R.S., Chief Gas Examiner to the Metropolitan Board of Works, on the results of the daily testings of the gas supplied by The Gaslight and Coke Company, the South Metropolitan Gas Company, and the Commercial Gas Company, during the quarter ending Dec. 31, 1877:—

#### 1. With respect to Illuminating Power—

Description of Gas and Testing-Place.	Min.	Aver.
The Gaslight and Coke Company—		
Common gas, Beckton . . . . .	15.9	16.6
"    Friendly Place . . . . .	16.0	16.4
Cannel gas, Millbank Street . . . . .	20.0	20.8
Common gas, Devon's Road . . . . .	16.0	17.1
"    Carlyle Square . . . . .	16.3	17.6
"    Camden Street . . . . .	16.0	16.6
"    Graham Road . . . . .	14.7	17.1
"    Ladbroke Grove . . . . .	16.1	16.8
South Metropolitan Gas Company—		
Common gas, Hill Street . . . . .	15.7	16.8
Commercial Gas Company—		
Common gas, Wellclose Square . . . . .	14.8	16.2
"    Parnell Road . . . . .	15.9	16.9

It will be seen from these results that the average illuminating power at all the testing-stations has been above the requirements of the Acts of Parliament, and at some of the stations considerably so.

2. As regards Purity.—Sulphuretted hydrogen has not been present in the gas at any of the testing-stations. The proportions of sulphur in other forms than this were as follows:—

#### Grains of Sulphur per 100 Cubic Feet of Gas.

Description of Gas and Testing-Place.	Max.	Aver.
The Gaslight and Coke Company—		
Common gas, Beckton . . . . .	19.1	13.4
"    Friendly Place . . . . .	18.8	9.7
Cannel gas, Millbank Street . . . . .	20.0	14.0
Common gas, Devon's Road . . . . .	21.2	10.4
"    Carlyle Square . . . . .	20.7	12.2
"    Camden Street . . . . .	21.3	15.1
"    Graham Road . . . . .	19.7	15.6
"    Ladbroke Grove . . . . .	32.2 <sup>a</sup>	17.4
South Metropolitan Gas Company—		
Common gas, Hill Street . . . . .	24.0	13.8
Commercial Gas Company—		
Common gas, Wellclose Square . . . . .	22.9	11.5
"    Parnell Road . . . . .	25.7	20.2

<sup>a</sup> Unsatisfactory test.

It will be seen from these results that, with regard to sulphur, the average has at all the stations been better than required by the Acts of Parliament, and in most cases—especially Friendly Place, Devon's Road, and Wellclose Square—considerably so.

Ammonia has been present at all of the stations in greater or less quantity, but at Ladbroke Grove, Millbank Street, and Devon's Road it has appeared rarely—in the latter on one occasion only, and then to a slight extent. In no single instance was the parliamentary maximum reached.

HACKNEY DISTRICT BOARD.—At the Meeting on Friday last, the General Purposes Committee reported that, in pursuance of reference, they had fully considered the report of the Surveyor upon the subject, and were not prepared to recommend the adoption of the average meter system in respect to the lighting of the streets in the district, but suggested that the number of burning hours should be reduced by lighting the lamps half an hour later in the evening, and extinguishing the same half an hour earlier in the morning. They had ascertained from the Police Authorities that this arrangement would not produce any inconvenience in the district, and at the same time would effect a considerable saving, and they recommended that an arrangement be made with the Gas Company for carrying this into execution. After some conversation, in the course of which it was stated that the plan now proposed was precisely similar to that which had for some time past been pursued in Islington, and found to work well, the recommendation was agreed to.

Report by Dr. Stevenson on the gas supplied by The Gaslight and Coke Company to the Vestry of St. Pancras, during the month of December, 1877:—Maximum light, estimated by sperm candles, according to the Act—17.1. Minimum light, sperm candles—16.6. Average light, sperm candles—16.8. Traces of ammonia, indicated by turmeric test paper—Traces on all occasions. Traces of sulphuretted hydrogen, indicated by lead test paper—None on any occasion. Sulphur 16.02 grains per 100 cubic feet of gas, on the average.

Dr. Whitmore's report on the illuminating power, pressure, and quality of the coal gas consumed in the parish of Marylebone during December, and supplied by The Gaslight and Coke Company:—

	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quantity, of Sulphur in 100 Cu. Ft.	Mean Quantity, of Ammon. in 100 Cu. Ft.	Sulphuretted Hydrogen
	*Mean of 23 Obser.	High-est.	Low-est.	High-est.	Low-est.	Grains.	Grains.	
Gas supplied from the Fulham works . . . . .	16.14	16.31	15.60	20.47	9.06	18.40	0.46	No trace
Gas supplied from the Beckton and Bow works . . . . .	16.18	16.74	15.62	32.85	17.06	16.00	0.46	No trace
Cannel gas supplied from the Pimlico works . . . . .	20.13	20.80	19.24	21.43	11.47	18.06	0.36	No trace

Mean of daily readings of barometer . . . . . 29.78

    "    "    "    thermometer . . . . . 54.79

\* Each observation consists of ten readings of the photometer, at intervals of one minute.

The mean illuminating power of the three gases consumed in the parish was from one to two-tenths of a candle in excess of their respective standards, but all of them were observed at separate testings to be much more frequently below the standard than usual; the gas from the Fulham Works was eight times below the standard, that from Beckton and Bow was three times, and the cannel gas from Pimlico, was six times; this is most unusual, as it rarely happens that a deficiency of illuminating power occurs more than once, or at most twice in either of them. The amount of sulphur found in 100 cubic feet of the Fulham gas was a little over 18 grains, in the Beckton and Bow gas it was 16 grains, and in the cannel gas 18 grains; in neither of them did the ammonia amount to half a grain. The pressure of all the gases was good, and no trace of sulphuretted hydrogen was detected in either of them by the ordinary tests.



METROPOLIS WATER SUPPLY.

METROPOLITAN BOARD OF WORKS.

At the Meeting on Friday last, the Works Committee reported upon a communication from the Kent Water-Works Company, transmitting a notice of their intention to give a constant supply of water in parts of the Parish of St. Nicholas, Plumstead, and of the Parish of St. Luke, Charlton, together with a plan of such districts, and stated "that the Committee see no reason to dissent from the proposal."

Mr. WATKINS complained of the incorrectness of a statement made by Mr. Roche at the last meeting, to the effect that the Paddington Vestry had, upon a division, decided to support the Water Supply Bill of the Metropolitan Board, and that the letter to that body from the St. Pancras Vestry on the subject was ordered to lie on the table without being read. In consequence of that statement, he (Mr. Watkins) had written to Mr. James Flood, who was Chairman on the occasion, to ascertain whether it was true that the communication from St. Pancras, who had always been on friendly terms with Paddington, had, as asserted, simply been ordered to lie on the table. The reply from Mr. Flood was that no such order was made, but that the letter was duly received, and read by the clerk in the usual way.

A report was presented from the Fire Brigade Committee in reference to the alleged defect of the hydrants used at the recent fire in Cherry Tree Court, Aldersgate Street, on the night of the 4th inst. The Committee had inquired into the correctness of the statement, and the Chief Officer had made a report to the effect that at the fire in question three hydrants in Aldersgate Street were got to work, and were doing good service, when the pressure was found to fail, and engines were set to work instead. On inquiry, it appeared that the turncock had opened three of the old plugs in Aldersgate Street, running fast, and this serious mistake was the sole cause of the pressure failing. The Chief Officer further stated that the supply of water from the hydrants was perfectly good for six 1-inch jets, with a pressure sufficient to reach the highest building in the neighbourhood.

Mr. EDWARDS said that the failure in the pressure on these hydrants was solely caused by the turncock drawing these three plugs, and letting the water out from the main; but when the Board obtained possession of the water supply of the Metropolis, such a mistake would never occur again.

Mr. RUNTZ said if he understood this explanation, it appeared to him that had there been six hydrants instead of three the pressure would have been still less.

Mr. ROGERS remarked upon the curious manner in which this case had been used by some parties as an argument in favour of the Board's Bill for a new supply, but said that inasmuch as it had been stated so repeatedly that the New River Company were at present supplying such a pressure of water as to render these hydrants efficient, it now appeared that upon the hydrants being at work the opening of three ordinary plugs to supply the fire-engines rendered the hydrants useless. He doubted whether Parliament would allow the Board to expend some five or six millions of money in providing an entirely new supply of water for the whole of London, in order that the required pressure might be secured for these hydrants.

Mr. JONES said he had lately had the privilege, by an invitation from the Corporation of London, of being present at a trial of hydrants in the City of London, which had proved most satisfactory. None of the hydrants threw water to a less elevation than 75 feet, and some of them reached upwards of 100 feet. He afterwards went to a trial of them at Bow, where he saw water thrown over the top of the railway station, and he could assert that their action was most efficient.

The report was agreed to.

MARYLEBONE VESTRY.—At the usual Meeting on Thursday last, Mr. Todd moved—"That the Parliamentary Committee be instructed to draw up a petition against the proposed Metropolis Water Supply Bill, with power to print the same, and forward copies to each member of the House of Commons; also to watch the progress of the Bill in the House, and to call on the Churchwardens to convene a public meeting of the Ratepayers, if considered necessary, in opposition to such Bill." He said the Vestry were, no doubt, aware that the first proposition in the Bill was to give a constant supply of pure and wholesome water, by sinking artesian wells. This was, he contended, a most Utopian scheme, because there was not the slightest necessity for it, inasmuch as they were already supplied with water as good as that proposed to be supplied. For instance, he saw, by statistics, that the West Middlesex Company supplied water as pure as that supplied by standard water, the Kent. Then the expense of the proposed scheme to supply the Metropolis with this super-excellent water would be enormous. There were 536,733 houses to be supplied, and to supply these houses, 2597½ miles of mains would have to be laid down; then each householder would have to provide a duplication of pipes in his house at a large expense, and this water was only to be used for drinking and culinary purposes. With regard to the cost of the works, the Metropolitan Board estimated it at 5½ millions, but that was simply an estimate. He had considered the subject, and he found that the work proposed to be done had cost the present Companies, who did their work as cheaply as possible, the sum of £11,556,843, and it was not at all likely the Board would do it at a less cost. Then it was proposed to lay down 75,000 hydrants, and to make other expensive alterations, and if the works were carried out as proposed, a rate of 10d. in the pound upon the Metropolis would be required, and he hoped the Vestries of the Metropolis would oppose the Bill, and prevent a frightful injustice being committed upon the ratepayers. The motion having been seconded by Mr. Verey, the debate was adjourned.

Dr. Frankland reports as the result of his analyses of the waters supplied to the Metropolis and some of its suburbs during December, that taking unity to represent the average amount of organic impurity in a given volume of the Kent Company's water during the last nine years, the proportional amount of such impurity in an equal volume of water supplied by each of the other Companies, and by the Tottenham Local Board of Health, was—Colne Valley 1.1, Kent 1.3, Tottenham 1.4, New River 3.0, East London 3.5, Southwark 5.3, Chelsea 5.3, Lambeth 5.6, Grand Junction 5.7, West Middlesex 5.9. The water drawn from the Thames by the Chelsea, West Middlesex, Grand Junction, Southwark, and Lambeth Companies was much polluted by organic matter, some of which was of most objectionable origin, and, although it was efficiently filtered by four out of the five Companies, it was quite unfit for dietetic purposes. The water delivered by the Grand Junction Company was slightly turbid, and contained moving organisms. The water of the Lea, as delivered after efficient filtration, by the New River and East London Companies was also polluted, although to a much less extent. The only good water supplied to London and the suburbs during December, and submitted to analysis, was obtained from deep wells in the chalk. It was distributed by the Kent and Colne Valley Companies, and by the Tottenham Local Board of Health. This water was bright, sparkling, wholesome, and palatable, and that portion of it delivered by the Colne Valley Company, having been softened by Clark's process, was not only of most excellent quality for dietetic

purposes, but was also well adapted for washing. Seen through a stratum two feet deep, the water supplied by the Kent and Colne Valley Companies, and by the Tottenham Local Board was clear and colourless; the East London Company's water was clear and nearly colourless; the New River Company's water, clear and very pale yellow; that distributed by the Chelsea, West Middlesex, Southwark, and Lambeth Companies, clear and pale yellow; and that by the Grand Junction Company, slightly turbid and yellowish brown.

Results of Analysis expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Mat- ters.	Or- ganic Car- bon.	Or- ganic Nitro- gen.	Ammonia.	Nitrogen, as Ni- trates and Nitrites.	Total combined Nitro- gen.	Chlo- rine.	Total Hard- ness.
Inner Circle.								
Thames—								
Chelsea . . . . .	25.96	.257	.053	0	.216	.269	1.65	18.8
West Middlesex . . . . .	27.16	.298	.053	0	.200	.253	1.60	19.9
Southwark and Vauxhall . . . . .	29.54	.262	.050	0	.219	.269	1.55	21.2
Grand Junction . . . . .	28.36	.269	.067	0	.205	.272	1.55	21.0
Lambeth . . . . .	29.72	.283	.048	0	.266	.314	1.70	20.3
Outer Circle.								
Other Sources—								
New River . . . . .	28.96	.147	.031	0	.326	.357	1.55	22.4
East London . . . . .	20.30	.166	.041	0	.024	.065	1.75	13.4
Kent . . . . .	40.30	.062	.015	0	.524	.539	2.50	27.5
Colne Valley . . . . .	12.10	.050	.014	0	.309	.323	1.40	5.6
Tottenham Bd. of Health . . . . .	14.00	.054	.027	0	.271	.298	3.15	25.0
Corporation of Birming- ham . . . . .	27.82	.195	.048	.003	.374	.424	1.90	16.4
Corporation of Glasgow . . . . .	2.90	.207	.028	0	.006	.034	0.65	1.0

\* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.  
+ Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

The Registrar-General publishes the following returns of the average daily quantity of water supplied by the London Water Companies during the month of December, 1877. According to these, 116,033,974 gallons, or 527,195 cubic metres of water (equal to about as many tons by measure, tons by weight) were supplied daily; or 215 gallons (97.7 decalitres) rather less than a ton by weight, to each house, and 30.3 gallons (13.8 decalitres) to each person, against 29.3 gallons during December, 1876.

COMPANIES.	Number of Houses, &c., supplied in		Aver. Daily Supply of Water in Gallons* during	
	Dec., 1876.	Dec., 1877.	Dec., 1876.	Dec., 1877.
Total supply . . . . .	531,445	538,874	110,423,339	116,033,974
From Thames . . . . .	250,648	254,179	56,032,761	57,864,383
„ Lea and other Sources . . . . .	280,797	284,695	54,390,578	58,169,591
THAMES.				
Chelsea . . . . .	28,737	28,859	6,881,606	7,622,200
West Middlesex . . . . .	48,680	50,135	9,533,505	8,913,001
Southwark and Vauxhall . . . . .	90,705	79,440	17,820,000	18,210,000
Grand Junction . . . . .	37,055	37,910	10,284,856	10,713,682
Lambeth . . . . .	55,471	57,833	11,512,800	12,405,500
LEA AND OTHER SOURCES.				
New River . . . . .	125,011	126,071	24,132,000	26,073,000
East London . . . . .	110,354	113,192	23,849,800	25,215,650
Kent . . . . .	45,432	45,432	6,408,778	6,880,941

\* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for December, 1877, as compared with that for the corresponding month of 1876, shows an increase of 7429 houses, and of 5,610,635 gallons of water supplied daily.

Dr. Whitmore's report on the composition of Thames Companies and other waters supplied to Marylebone during December:—

	In Grains, per Gallon.		In Parts, per Million.		In Degrees.	
	Total Solid Matter.	Loss by Incine- ration.*	Chlo- rine.	Free Ammo- nia.	Albu- minoid Ammo- nia.	Hard- ness after boil- ing Fifteen Minutes.
West Middlesex . . . . .	20.16	0.88	1.19	0.01	0.07	14.1
Grand Junction . . . . .	20.80	0.80	1.18	0.01	0.08	14.4

\* The loss by incineration represents the amount of organic and other volatile matters contained in the Imperial gallon (70,000 grains) of water. The total solid matter, minus such loss, consisted principally of carbonate of lime, with small quantities of other equally harmless salts.

The water of both Companies, as seen through a glass tube two feet in length, was clear and bright. The water taken direct from the River Thames at Hampton was in good condition.

THE POLLUTION OF RIVERS.—On Wednesday last the annual meeting of the Association for Preserving the Rivers and Lochs of Scotland from Pollution was held in the Freemasons Hall, Edinburgh—Sir Robert Christison occupying the chair. The report of the Council stated that a number of towns were considering how the sewage therefrom was to be disposed of otherwise than by allowing it to go into the adjoining streams, and were in course of adopting measures for carrying out the Rivers Pollution Act of 1876. The Council recommended the members of the Association and other riparian proprietors to avail themselves of their rights under the law of Scotland for preserving the purity of the rivers and streams passing through their various properties. The Chairman, in moving the adoption of the report, said his opinion was that no one had a right to do anything that would pollute food, drink, or air. Every man had a right to receive these in a pure state, and it was the duty of the Legislature to see that they were not polluted. Every year he saw confirmation of the doctrine which he had taken the opportunity of enforcing on the Association at the commencement—that there was no manufacture in which a nuisance might not be prevented sooner or later, if the manufacturers applied a little of that ingenuity to the abatement of the nuisances which they had hitherto applied only to the extension of their manufactories. It was agreed to memorialize the Government as to the adoption of certain amendments, which were considered necessary to be made in the Rivers Pollution Act



## THE MANCHESTER NEW WATER SCHEME.

A Special Meeting of the Manchester City Council was held on Wednesday, the 14th inst.—the Mayor (Alderman Grundy) presiding.

Alderman GRAVE moved—"That this Council hereby confirms the propriety of the promotion by the Council in Parliament of a Bill for the purpose of empowering the Corporation to obtain a supply of water from Lake Thirlmere, in Cumberland, and for other purposes, the costs and expenses of such promotion to be defrayed out of the public funds or rates in the hands of the Council, or hereafter to accrue to them on the water-works account."

Alderman PATTESON seconded the motion.

Alderman KING opposed the motion, and, in a long speech, endeavoured to show that the scheme for obtaining water from Thirlmere was not a desirable one for the Corporation to proceed with. He said that no doubt the proper time for taking exception to the adoption of the scheme was in June last, when a report was presented to the Council showing what the intentions of the Water-Works Committee were in regard to Thirlmere. It must, however, be remembered that they had only had that report in their hands from the Saturday previous until the Wednesday when the meeting was held. At that time he raised an objection, and asked for further time to consider the subject. Alderman CURTIS and other gentlemen joined him in that request, but the Council decided by a large majority to adopt the report at once. A question which meant the spending of millions of money on the part of the Council was deserving of more consideration than had been given to it. They could waste an hour or two in discussion as to whether they should charge sixpence extra for persons viewing the Town Hall because of the cost of having an additional policeman, but they could pass over as a matter of comparatively small importance, or at all events without giving members an opportunity of properly judging of its merits, this scheme, which would involve the Corporation in the expenditure of unknown millions. He repeated that it would involve the expenditure of "unknown millions." The ground for that haste could not have been that there was not time to allow another month on account of parliamentary exigencies, and even if it had been so, whose fault was it? The matter had been under consideration by a special committee for one or two years. During all that time it had been considered by the Committee, he had no doubt, carefully and well, but the proceedings of that Special Committee were not reported from time to time, like those of ordinary committees, to the Council. They had no means of checking their action from month to month. He merely referred to this to show that it was not his fault that the Council had not had time to discuss the question, but that it arose from the action of the Water-Works Committee. He was not going to touch on what was called the sentimental part of this question. The question he wanted to bring before the Council was the ratepayers' question—to see how the scheme would affect the ratepayers. In the report to which he had alluded, the Council would remember, there was an extreme vagueness as to the capital likely to be required, the results they were likely to obtain, and he might say there was an entire absence of any statement as to the probable income and expenditure after the water had been brought from the lake. He complained that the Council had been kept in the dark upon these important matters. Moreover, no reason was given in the report why the Committee abandoned the scheme for obtaining a supply from Ulleswater, where there was abundance of water, although the estimated cost of carrying out the present scheme was something like £680,000 in excess of the estimate in the former case. He would, however, invite the attention of the Council to the earlier water-works scheme. He found that in 1849 the total estimated cost was £450,000, although in the first instance it was only to have been £300,000. They went on for a few years, and by the end of 1853 he found that the new works had cost £588,000, and it was reported that the Committee's borrowing powers were exhausted, that they wanted £15,000 to pay off some debts for land, and that Mr. Bateman said it would still require £35,000 to complete the works. The Council again applied to Parliament, and an Act enabling them to borrow £200,000 was obtained. In 1861 the Committee were still short of money, and consequently borrowed £195,000. In 1864 it appeared that that did not suffice to complete the works, and another sum of £195,000 was borrowed. A year later they were still short of funds, and therefore borrowed £100,000 more. He traced the different stages through which the works had passed, pointing out how the expenditure had gone on increasing until, in 1875, they applied to Parliament for power to borrow £500,000, a sum actually in excess of the amount that the works were estimated to cost in the first instance. If the original estimate had been so far exceeded in the past, what, he asked, might they expect in the future? And yet what security had they that they would not go on as aforesaid? He had quoted the figures relating to the past, not as proving what would be the history of the future, but from a desire to let the ratepayers know what, by analogy, they should expect.

Mr. LAMB: Give the profits, and what the works are worth now.

Alderman KING said he meant to give the whole question as he had prepared it. If his information was defective it was not his fault, because he had done all he could to put himself in possession of the facts bearing upon this matter. He wrote to Mr. Berrey, the superintendent of the water-works, asking for certain information, but his request was not acceded to because the Committee passed a resolution not to furnish statistics to any person. With regard to the supply of water that might be expected from Thirlmere, as far as he could make out, from 26 to 29 million gallons was the utmost that the new scheme would give to Manchester. He deprecated the anxiety so frequently manifested to increase the sale of water outside the limits of the borough, contending that the result of that policy was seen in the fact, as he was informed, that the present supply would only last five years longer. Such was the state of affairs now that, with the highest domestic water-rate that was ever levied, and with a considerable sum of money for repairs being placed to capital account, the current revenue expenditure did not balance in the year 1876 by £10,500. They were losing £10,000 a year, and another £10,000 per annum was required for interest and reduction of capital, making £20,000 a year, which they would have to realize by extra sales before they got to the termination of their present supply. While the income had increased 47·7 per cent., the current expenditure had increased 55·3 per cent., thereby showing that the expenditure was going up at a greater rate than the income. If the Council persevered in the course they had adopted, of selling water for trading and other purposes, beyond supplying the people of Manchester who found the money and ran the risk, at prices which were considered utterly inadequate, in five years the supply would be exhausted. The £2,500,000 which they would then have expended would require them to raise £100,000 a year for interest and £25,000 for a sinking-fund. All this would have to be met after the new works had been constructed, and, supposing they adhered to their present policy, the increased income would only be from £80,000 to £95,000. They could not expect that the income would increase at a greater ratio than it had in the past eight years, nor could they anticipate that the expenditure would increase at a less ratio. He had been greatly astonished at these things, and if he had not had considerable experience he would have thought he had fallen into some strange mistake in his calculations. He was convinced, if the scheme

was proceeded with, that practically by the time the new works were constructed the Water-Works Committee, as a committee, would be utterly insolvent, and that the ratepayers generally would have to be called upon in some way to make up the deficit. He felt it was absolutely necessary that a sharp and increasing pressure should be put to lessen and gradually abolish the supply of pure water for trade purposes, where other water would do, in the surrounding districts, and reserve it as far as possible for domestic purposes. If that were done he had no doubt the existing works would last for a great many years longer. He suggested that water might be got in some districts by sinking Abyssinian wells. If, however, they must go to the Lake district, let them go to where Mr. Bateman assured them they would get the best and the cheapest supply—Ulleswater. He concluded by moving as an amendment—"That the discussion be adjourned for one month, and that in the meantime the Committee furnish the Council with estimates of the probable expenditure, the probable supply of water from Thirlmere, and also of the future financial position of the Water-Works Committee when the Thirlmere scheme is completed."

Alderman CURTIS seconded the amendment. He complained that the mover and seconder of the resolution had not adduced any reasons in its support. It appeared that the Council were not to have the information to which they were entitled from the Committee. He urged the desirableness of appointing a committee to carefully examine the statements made and conclusions arrived at by Mr. Bateman with reference to Thirlmere. If Mr. Bateman's statements on a former occasion had proved delusive, the Council ought not to place implicit trust in them now, but carefully inquire into them.

Mr. HARWOOD said that above all people Alderman King, as Chairman of the Gas Department, ought to have been silent on the question of committees keeping things secret. On other occasions Alderman King had, almost more than any other gentleman in the Council, sought to justify the means by the end, and that was the course which the Water-Works Committee had taken on this question. The Committee had more confidence in the ability and experience of Mr. Bateman than in the ability and experience of Alderman King. Mr. Bateman had said that 50 million gallons of water could be brought from Thirlmere, and that was against Alderman King's statement of 27 million gallons. The Committee had not relied merely on Mr. Bateman's wisdom and advice. They had engaged, during the past few months, the most eminent engineers and lawyers, who had examined the scheme in all its details. They all confirmed Mr. Bateman's report, and thus strengthened the hands of the Committee.

Alderman LAMB pointed out that the taking over of the water-works had not cost the ratepayers one penny, and that they were not now paying so much for water as they paid under the old system.

Alderman PATTESON said it was unfortunate that this discussion had taken place. The Committee had given all the information they possibly could. He was afraid that the discussion would weaken the hands of the Committee. There was a complete answer to all that Alderman King had said with regard to the increased cost of the old works, and as to the supply of water to the outside districts. He (Alderman PATTESON) was prepared to go into every charge that had been made, but he did not think it was necessary then to do so.

Alderman MURRAY said if Alderman King had exercised a little more discretion, he would hardly have taken the course he had done. Had he been specially retained and entrusted with a brief on behalf of the opponents of the scheme, he could not have been more energetic. Alderman KING, however, must not flatter himself that he was going to provoke the Chairman to reply on the whole question. The Chairman had been advised by the Town Clerk that nothing could be more injurious to the passing of the Bill than to disclose all the information that they were in possession of.

Mr. STEWART hoped that the Chairman would not commit himself by any reply, seeing that they would have to be met by Alderman KING and others.

Alderman GRAVE said he was not going to make a formal reply to all that had been said. He wished, however, to say that the citizens had had every opportunity of judging of the merits of the scheme. They had been put in possession of all the accounts that could possibly be given to them; they had had the opportunity of reading the various reports on the subject; and they had seen the reports of the speeches made in the Council. They were convinced of the utility of the work, or they would have attended the public meetings and opposed it. To judge from some of the remarks made that morning, the Council would be launched into the condition of not being able to pay their way; but what was the fact? The closing of the Longendale system would liberate a large amount of money that was now expended there, and which could be applied to the Thirlmere system. There was not a single thing that Alderman KING had advanced which he (Alderman GRAVE) could not controvert; but he should act on the advice of the Consulting Town Clerk, and reserve all he had to say for the tribunal to which they would have to appeal. He feared nothing that Alderman KING could divulge. He told him to his face that all along he had divulged many things which had been injurious—very seriously injurious—in a monetary sense, to that Council.

Alderman KING, who rose amid cries of "Vote," said: The charge has been made that I have divulged the secrets of this Council.

Alderman GRAVE: Of the Committee.

Alderman KING: I give the charge a most emphatic, utter, and absolute denial.

Alderman GRAVE: I had it from your own mouth.

The amendment was then put, and only four voted for it. The number against it was 47.

The original resolution was put and carried by 48 to 3.

THE PROPOSED PURCHASE OF THE BANGOR WATER AND GAS WORKS.—The ratepayers of Bangor have confirmed the resolution of their Local Board to proceed with the Bill for the compulsory purchase of the water and gas works. The poll showed a considerable majority in favour of the undertaking. The next step to be taken is the arrangement of the terms of purchase. The Company ask for £70,000; the Local Board offer £42,000.

GAS EXPLOSIONS.—A correspondent of *The Times*, referring to the recent fatal accident at Southport, says:—"Some months since you were good enough to insert in your columns half-a-dozen lines which I addressed to you, calling the attention of the inmates of houses to the precautions that should be taken upon the detection of an escape of gas. I then said that hanging in my kitchen was a card, upon which the following words were legibly written:—'In case of an escape of gas, immediately turn off at the meter, open all doors and windows, and call me.' In *The Times* of this morning I read another of these lamentable and fatal accidents, which so frequently result from the non-observance of this very simple suggestion. If you would again call attention to the easy way in which explosions might often be avoided, I believe that it would tend to the saving of life." A subsequent correspondent writes:—"Your correspondent, 'J.,' in his directions as to the precautions to be taken when an escape of gas occurs, omits the most important and essential one—viz., 'Do not take a lighted candle to explore the cause of the escape, or to find the gas-meter.' With this addition his suggestions may be of use."



## MUNICIPAL FINANCE.

On the 12th ult., a Lecture on the above subject was delivered before the Manchester Statistical Society, by Mr. John GOODIER, Registrar of Stock to the Manchester Corporation.

Mr. GOODIER said the paper he had to submit to the Society had been suggested by the various discussions which had taken place on the subject of local taxation, and more recently by a startling paper in the *Economist*, on the expenditure and indebtedness of the great cities of America. He ventured to say at the outset that we had no reliable statistics published on which we could form accurately a complete idea of the financial position of the Local Authorities in this country, and that the Blue-Books to which statisticians naturally looked for guidance, published as they were by and on the authority of Government, were entirely misleading.

That the Government were perfectly aware of this fact was proved by the several alterations made during the past few years in the forms sent by them to the Local Authorities to be filled up, and more recently by the passing of the Local Taxation Returns Act, which was intended to secure uniformity and simplicity in the returns. The Local Government Board,

in their last circular, dated September, pointed out that Municipal Authorities frequently omitted from their returns the expenditure and indebtedness of their gas and water works. He considered, however, that if the system of audit provided by law were faithfully carried out in all boroughs, ratepayers would have an efficient check upon the expenditure of their Town Council.

The Manchester return gave a full and accurate statement of the receipts and expenditure of the Corporation; it was published in one volume, and any ratepayer, upon the payment of a small sum, could obtain a copy at the Town Hall. The practice in other boroughs was to split up the receipts of the several departments, and publish each separately, so that it was difficult to ascertain from particular boroughs what the aggregate receipts and expenditure and the aggregate indebtedness amounted to at any period. He urged the desirableness of the Government appointing a Minister of Local Finance with a view to putting an end to the present municipal chaos, and suggested that the Municipal Corporations Association should take up the subject.

The table annexed, which he submitted for consideration, was, he said, in many respects most remarkable:—

*Comparative Statement of the Population, Rateable Value, and Local Indebtedness of the undermentioned Boroughs and Cities, showing the Increase per Cent. under each Heading within the past Sixteen Years.*

City or Borough.	Area in Acres.	Persons to an Acre, 1877.	Population, 1861.	Estimated Population, middle of 1877.	Increase per Cent.	Rateable Value, 1861.	Rateable Value, 1877.	Increase per Cent.	Municipal Rates, 1877.	Indebtedness, 1861.	Indebtedness, 1877.	Increase per Cent.
						£	£		s. d.	£	£	
Brighton . . . . .	2,354	43·4	77,693	102,264	31	341,249	539,769	58	3 7 a	143,300	262,557 c	83
Wigan . . . . .	2,188	—	37,658	39,110	3	72,516	125,000	72	—	138,247	365,153	164
Bolton . . . . .	1,822	—	70,395	82,853	17	168,784	351,000	108	3 6	268,300	1,635,000 d	509
Plymouth . . . . .	1,395	52·3	62,599	72,911	16	127,582	180,000	41	3 7	88,600	168,309	89
Wolverhampton . . . . .	3,396	21·6	60,860	73,389	20	298,785	396,623	32	4 7 a	64,100	399,137 e	522
Birmingham . . . . .	8,400	44·9	296,076	377,436	27	845,427	1,352,556	59	4 4	534,754	4,635,890 f	766
Leicester . . . . .	3,200	36·7	68,056	117,461	72	141,000	321,000	127	4 6	96,849	269,963	178
Nottingham . . . . .	1,996	47·6	74,693	95,025	27	232,848	450,000	93	3 3	36,130	192,137 g	431
Liverpool . . . . .	5,210	101·2	443,938	527,083	18	2,061,662	3,072,100	49	3 4 ab	3,563,063	4,045,668	13
Manchester . . . . .	4,293	83·7	338,722	359,213	6	1,203,500	2,229,186	85	3 5	2,058,743	4,644,477	125
Salford . . . . .	5,170	27·3	102,449	141,184	37	352,905	750,229	112	1 8	126,777	1,032,285	714
Oldham . . . . .	4,666	19·2	72,333	89,796	24	184,690	438,874	137	2 0	353,334	766,018	116
Bradford . . . . .	7,220	24·8	106,218	179,315	68	302,920	813,490	168	5 4	756,238	2,826,132 h	273
Leeds . . . . .	21,572	13·8	207,165	298,189	43	504,855	1,033,133	104	—	588,495	3,331,056	466
Sheffield . . . . .	19,651	14·4	185,172	282,130	52	446,866	827,205	85	—	Nil.	274,000	—
Hull . . . . .	3,635	38·5	97,661	140,002	43	229,692	521,000	126	4 4	44,838	441,784	885
Sunderland . . . . .	3,306	33·4	78,211	110,382	41	170,000	369,500	117	3 2	76,000	250,500	229
Newcastle-on-Tyne . . . . .	5,371	26·5	109,108	142,231	30	316,948	710,613	124	4 6	173,341	501,967	189
Edinburgh . . . . .	4,191	52·2	167,851	218,229	30	756,902	1,389,465	83	1 6	387,245	569,999 i	47
Dublin . . . . .	10,050	31·3	249,733	314,666	26	590,000	630,000	6	8 1	280,000	833,000	197
Totals . . . . .	—	—	2,906,591	3,763,369	29	9,349,111	16,500,743	76	—	9,778,354	27,445,032	180

The figures relating to the population of Wigan and Bolton are taken from the Census Tables for 1871, as the Registrar-General does not include these towns in his report.

a Including water-rate.

ab Exclusive of watch, museum, and school board rates levied by precept on the poor-rate authorities.

c Exclusive of the debt created in 1872 for the purchase of the water-works.

d Includes purchase of gas-works, town-hall, and parks.

e Includes purchase of sewage works, town-hall buildings, public baths, &c.

f Includes purchase of gas and water undertakings, and a portion of improvement scheme under Artizans Dwellings Act.

g The large increase is due to extensive improvements having been made since 1861.

h The increase includes purchase of water, gas, and sewage works, parks, &c.

i Including debt for improvement of markets and slaughter-houses, &c.

It would be seen from this table that the 20 places enumerated had, in 1861, a total rateable value of £9,349,111, which had risen to £16,500,743 in 1877. At the former period the aggregate local debt was £9,778,354, whilst it was now £27,445,032. The increased ratio of indebtedness between the two periods was therefore much greater than the increase in the rateable value; but in many cases—and notably in that of Manchester—the disproportion could be accounted for by the Corporations having purchased large private undertakings, such as gas and water works, or by their having expended large sums in the extension of such works, and others of a strictly remunerative character.

There were other circumstances to be taken into consideration in making, under this head, a fair comparison between different towns. It would be seen that the area of the borough of Manchester was only 4293 acres. The increase in the population during the 16 years was 6 per cent., whilst the increase in the rateable value was 85 per cent., and the increase of indebtedness 125 per cent. Of the increased debt nearly a million was due to the extension of the water-works, and this was necessitated by the demands of the outlying districts, whose populations looked to Manchester for their water supply, and whose wants as private consumers the Corporation were compelled to meet.

It was clear, therefore, that if the borough of Manchester had an area as large as that of Birmingham, and that if it included the adjoining townships of Moss Side, Rusholme, Withington, Levenshulme, Newton Heath, and Gorton—districts really part of the city of Manchester, and really populous, owing to the circumscribed area of the borough and the demand for warehouse accommodation within it—the increase in the rateable value would be much greater than the increase of indebtedness. All those townships, again, used the new Town Hall—the cost of which was another item in the last-named increase—for business purposes connected with the gas and water works. It was consequently clear that no contrast could be made unless it was accompanied with the capitalized value of the remunerative works of the several Corporations. Hence it was an error of statistics—into which even Messrs. Rathbone and Whitehead had fallen—to measure the indebtedness of a borough with its rateable value. The table showed that Birmingham had a rateable value of £1,352,556, against Manchester, £2,229,186. The debt of Birmingham was now £4,635,890; but Manchester, with a rateable value of 64 per cent. more, had only about the same amount of debt. The Gas and Water Works of Birmingham had only recently been purchased, and it was not likely the Shareholders would sell those undertakings for less than their value, whatever they might be worth 20 years hence, so that the Birmingham Corporation's assets in those respects might be balanced against the liabilities.

It had been estimated by competent judges that the Manchester Gas-Works were worth at least £3,000,000, but the mortgage debt was only £405,602. The Manchester Water-Works were certainly not worth less than £3,500,000, while the value of the manorial rights and the improvement properties counted for another £1,000,000; so that upon a moderate estimate they had assets here, in real property, of 7½ millions, to secure a debt of little over 4½ millions, without taking into account the high rateable value of Manchester. The fact was, excluding the strictly remunerative works, the debt of the Manchester Corporation, including the debt for the new Town Hall, was only £852,000. It was no exaggeration to say that the financial transactions of the Manchester Corporation were not surpassed, even if they were equalled, by any other borough in the United Kingdom.

The table also showed that whilst the rateable value of Birmingham had increased 59 per cent., the increase of indebtedness was 766 per cent. within the same period. The rateable value of Hull increased 126 per cent., but the increased debt was 885 per cent. Bolton, Wolverhampton, Leeds, and Nottingham had each an increase of indebtedness of upwards of 400 per cent.; whilst Manchester, as already stated, was only 125 per cent., notwithstanding its large assets.

There were 229 municipal boroughs in England, and, excluding Edinburgh and Dublin, they had in their return a gross total of £26,041,033 owing by 18 boroughs. An analysis of the whole showed that the population had increased at the rate of 29 per cent., the rateable value at the rate of 76 per cent., and the indebtedness at the rate of 180 per cent.

It would be well indeed if those who dealt with the statistics of local government would inquire, not only what was obtained in return for the expenditure which they criticized, but how the respective Corporations viewed the important questions of capital and revenue, classifications which, under an imperfect knowledge of finance, had shipwrecked many apparently prosperous concerns. The Corporation of Manchester had nothing to fear from such an inquiry—rather the contrary—for it would be found upon examination that their views upon finance were as stable and sound as the commercial reputation and the credit of their prominent members.

**EXETER WATER SUPPLY.**—At the meeting of the Exeter Town Council on the 9th inst., a letter was read from the Dartmoor and Exeter Water Company, stating that they were willing to hand over their undertaking to the Council on payment of costs incurred, not exceeding £2000. A resolution was passed accepting the offer, and directing the Town Clerk to draw up an agreement for payment of the money, subject to the approval of Parliament; and it was also resolved to take no further steps with the Company's Bill.

**SEWAGE FARMING.**—The West Derby Local Board of Health, whose district is one of the suburbs of Liverpool, utilize the sewage on a farm under their own management. It is not a profitable enterprise, according to the figures mentioned at the meeting of the Board on Wednesday last. It was then stated that the receipts from the farm during the season had been only £2853, whereas the anticipatory calculation was £5058. The year's loss on the farm was stated to be upwards of £4000, and during its six years existence the total loss had been about £20,000.

**SALE OF THE FENTON GAS-WORKS.**—At the meeting of the Fenton Local Board on the 1st inst., the Chairman said that since the last meeting of the Board some fresh information had come to the knowledge of the Committee who had considered the gas question. It seemed there was a mortgage of £350 upon the Gas Company, which the Board did not know previous to the late meeting, and that they would have to pay conjointly, as well as the expenses incurred in promoting the Bill, and these would be considerable. That was, perhaps, only what they might expect, as they were buyers and the Company were sellers, and there was a sense in which it was a compulsory sale, although, as a shareholder himself, he hardly saw it in that light. He moved a resolution to the effect that it was expedient to promote, and that the consent of the Board be given to the promotion of a Bill in Parliament in the ensuing session, in conjunction with Stoke, to acquire the works and undertaking of the Stoke, Fenton, and Longton Gas Company, the expenses to be defrayed out of the general district rate. The motion was seconded by Mr. Green, and carried.



## BILSTON GASLIGHT AND COKE COMPANY.

The Annual Meeting was held on Monday, the 7th inst.—Mr. W. HATTON in the chair.

The Directors report stated that the trade account showed a profit of £3415 19s. 4d., which, with £1782 3s. 11d. brought from last year's account, made a total of £5198 3s. 3d. at the disposal of the Directors. This sum they proposed to appropriate as follows:—Half year's dividend paid Aug. 1, 1877, £1400; half year's dividend payable Feb. 1, £1400; one year's interest on debentures, £296 5s.; to reserve-fund account, £200; to carry forward to next year's account, £1901 18s. 3d.—total, £5198 3s. 3d. The Directors add "they have great pleasure in being able to present a favourable report of the Company's business during the past year, a period of almost unexampled depression of trade, in which Bilston has shared in common with other manufacturing towns. Considerable progress has been made in the erection of the new works; they were put in operation at the beginning of the present winter with satisfactory results. The railway siding, though not complete, has been made available for use, and when finished will effect a substantial saving in the cost of haulage of coal. A further outlay will be necessary next year for the erection of workshops, stores, and offices; when completed, the whole of the Company's business will be transferred to Millfields. The works at Moxley, and the land adjacent thereto, will then be for sale."

The trade account was as follows:—

Dec. 31, 1876—	Dr.		Dec. 31, 1876—	Cr.	
Stock		£424 3 9	Sales		£5,837 13 3
Purchases		3,335 0 3	March 31, 1877—		
March 31, 1877—			Sales		5,075 3 7
Purchases		2,433 9 7	June 30—		
June 30—			Sales		2,513 8 11
Purchases		1,737 11 5	Sept. 30—		
Sept. 30—			Sales		2,714 13 4
Purchases		1,882 12 7	Rents, &c.		49 18 11
Wages		2,300 1 0	Stock		153 10 0
Deterioration of works		560 0 0			
Advances and bad debts		255 10 1			
Balance (profit)		3,415 19 4			
		£16,344 8 0			£16,344 8 0

The CHAIRMAN, in moving the adoption of the report, said it was very satisfactory to the Directors to be able to present one so favourable, under circumstances which had been peculiarly depressing to the trade of the neighbourhood. They had not suffered as a company to the extent to which the manufacturing interests generally had been affected. Probably this was because it took as much light to do a small business as it did for a large one. Another year they hoped, however, to announce an increase in their profits. No doubt the depressed state of trade had prevented an extension of their mains, and also an increased consumption, because everybody who could economize would, at such a time, do so, and would not add to their number of burners if they could possibly avoid it. The Directors were glad to say that considerable progress had been made at their new works, and, from the operations that had already been conducted there, very satisfactory results might be anticipated, among these being the probable removal to Millfields of the whole of the works during the year. He hoped it would not be very long before not only the Shareholders, but the town at large, would derive much advantage from the new works. He thought, indeed, that the town had already reaped, from those works, advantages in the shape of a better supply of gas. As the necessity arose, the Board would, from time to time, extend the mains in various directions, for they were convinced that, notwithstanding the new discoveries which had been made in means of illumination, the existing method of lighting by coal gas would still be in vogue for very many years to come, and would, indeed, become more extensively used every year by all classes of the community. He hoped that before long the Company would realize the full dividend which the Act of Parliament allowed them to pay—viz., 10 per cent. For years past they had been self-denyingly content with 6 per cent. and 8 per cent., and as soon as such a course was advisable, the Directors would be glad to distribute the full amount.

Mr. HOLCROFT seconded the motion, which was agreed to.

Mr. HICKMAN moved—"That in addition to 4s. per share paid on the 1st of August last, a further sum of 4s. per share be paid, free of income-tax, on the 1st day of February next."

Mr. HOLLIDAY seconded the motion, which was agreed to.

Messrs. Baker, Colbourn, and George Edwards, retiring Directors, were re-elected, and Messrs. E. Ellis and T. S. Hatton were re-appointed auditors.

Mr. J. ROGERS, in moving a vote of thanks to the Directors for their services during the year, said that the present condition of the new works showed that they had attended well to their duties.

The vote having been seconded by Mr. J. PRICE, and carried,

The CHAIRMAN acknowledged the compliment, remarking that the Directors heartily appreciated the confidence which the shareholders had placed in them for many years. Although a director himself, he could speak impartially concerning his colleagues, and could assure the shareholders that they had laboured hard to make the Company a success. Some of the gentlemen whom he could name as being specially qualified to do so, had bestowed great attention on the new works, and through them those works had been constructed with economy and efficiency, and not before they were required. Several years ago some of the Shareholders doubted the propriety of putting up new works; but now he believed all were agreed that such a proceeding had been warranted by what had since taken place. He moved that the thanks of the Shareholders be given to the officers of the Company for their efficient services.

Mr. REEVES acknowledged the same.

In reply to Mr. S. Thompson, the CHAIRMAN stated that the actual amount of bad debts for the past year was only about £30, which was mainly due to a joint-stock firm going into liquidation.

The usual compliment to the Chairman closed the meeting.

## GAS EXPLOSION AT SOUTHPORT.

A fatal accident, arising from an explosion of gas, occurred at Southport on Saturday, the 5th inst., in a building attached to the residence of Dr. Lang, the Medical Officer of Health of the Local Board of Birkdale. The building consisted of two storeys, the lower one being let off as a school-room, and the upper one being used by Dr. Lang as a billiard-room. Having been told that there was a smell of gas in this room, Dr. Lang proceeded to ascertain the cause, and having unfortunately struck a match for the purpose of testing the fittings, a violent explosion of the gas which had accumulated in the upper part of the room immediately took place. The explosion caused the destruction of the roof of the building, and some of the timbers falling upon Dr. Lang, he was killed instantaneously. His daughter and a servant girl were also injured.

On Monday evening the CORONER (Mr. Driffield) held an inquest on the body, when the following facts were elicited:—

George Herbert Lang, aged 15, son of the deceased, said: On Saturday morning about half-past nine I was called down by my sister, who said my father wanted me. I went into the garden, and found him at the bottom, near the billiard-room building. He got on to a wheelbarrow

from the outside, and broke a pane of glass in the school-room below, not being able to gain admittance, as it was let off to another person. He then opened the window, and went into the room, and turned off the gas from the meter. Returning the same way he went upstairs into the billiard-room, and I, my brother, and the cook followed. He got upon the billiard-table, and asked for a light. While the servant went to the mantelpiece to procure some matches, he took a box out of his waistcoat pocket, and struck a match, which I thought he placed to the top of the chandelier. The explosion took place immediately. Some plaster fell about me, but I was not affected by it otherwise than by feeling the heat. I ran out, and was followed by the cook and my brother, without noticing anything further. I did not return. When I first went up I noticed a smell of gas; but the windows in the billiard-room were opened. I was in the billiard-room the previous day, and then smelt gas, which caused me to examine the taps to see if they were closed.

Thomas Bond, gardener to the late Dr. Wood's family, said: When the accident happened I was in the saddle-room, which is directly opposite the building where the explosion took place. I heard a loud noise, which shook the floor as well as the building. I saw dust, burnt paper, &c., flying up, and I ran through the house into the street, and into Dr. Lang's garden. I first saw the children crying round the door, and they told me Dr. Lang was inside. I afterwards heard the servant crying for some one to come upstairs, stating that Dr. Lang was either dead or dying. I went up and found the doctor, who was lying across the billiard-table on his face, a piece of a spar being on one leg. His head was covered up with the debris, and I called for some men to come up. A spar lay across the back of the deceased's neck, which I could not lift, as there was a great weight upon it. Eventually, with assistance, the spar was removed, and the doctor taken from under. He was quite dead, and we carried him into the house. I did not smell any gas. The roof had fallen in, so that the spars rested on the table, the chandelier being on the floor. I afterwards looked into the lower room, but perceived nothing.

Mr. Robert Iddon, Manager of the Corporation Gas-Works said: On Saturday morning, about 10.45, I went to the scene of the explosion, and found the upper portion of the premises wrecked. There was no escape of gas, and on examination I saw it was turned off at the meter. Afterwards I went into the upper room, and found the pendant lying on the floor, being broken from its connection at the top. I then examined the pendant more closely, and found the whole of the four taps turned off. I also noticed that the connection had only been soldered, instead of being brazed; and it is my opinion that at one time it had been used for a water-tap pipe. It did not fit properly, and had been covered with soap, which must have been used on several occasions. I think the gas had escaped and lodged between the slates and the roof, which, in the centre, would be about four or five feet in height. It had evidently formed a sort of magazine, which in all probability had been fired by the doctor's own match. I have also reason to believe that there was no gas chandelier before the doctor went to reside there. I have myself known of a case similar in every way.

The CORONER said that if the Jury chose they could have further evidence from the servant or the medical gentlemen; but he thought, from the evidence already given, they might dispense with that. The mystery was that the doctor turned off the gas at the meter, and then tried to find the leakage.

The JURY having decided that they were satisfied with the evidence given,

The CORONER, in summing up, said the explosive character of gas when mingled with atmospheric air was not generally known. People supposed that it was more dangerous the purer it was, whereas the reverse was the fact; the more it was mixed with atmospheric air the greater was the danger. He mentioned it at an explosion at Pemberton a few days previously. It was there stated by competent engineers that with gas—that was, pit gas, which was almost the same—an admixture of 5 per cent. of gas to 95 of atmospheric air, was at once explosive. Pure gas would not explode. They might take gas from a gas-pipe into a tin receiver, fill it, and then fire it harmlessly; but if they took the same receiver, and only put a little gas into it, and then applied a light, there would be an explosion. Consequently, gas mixed with air was the more dangerous, and in the space between the slates at the doctor's it would be mixed highly, for the slates could not be air tight. He (the Coroner) looked upon the strength of the explosion from the admixture as being very great. It appeared that after running upstairs the doctor smelt something, and opened the windows, thinking it the best thing to do. He then went down to the lower room and turned off the gas at the meter. Afterwards he must have returned upstairs, tried the gas on the spur of the moment, forgetting for the time that he had turned it off, and not thinking that there might be a magazine above. That fact had constantly been forgotten, even by gas men themselves. He (the Coroner) therefore thought that the verdict might be one of accidental death or misadventure, for he believed there was no blame attached to any one. He needed not to tell them that the doctor himself was a very scientific man, and a man whose experience was great, and in such a case, were he to see a similar case himself, he would be the first to note the mischief.

The Jury returned a verdict to the effect that the deceased had come to his death accidentally and by misadventure.

The sad event has caused a feeling of profound regret throughout the town, the deceased having taken a very active part in public affairs, and being much respected.

## LIQUEFACTION OF OXYGEN.

On Christmas morning last a telegram from Professor Pictet, of Geneva, addressed to Professor Tyndall, appeared in *The Times* newspaper, announcing that, on the previous Saturday, M. Pictet had succeeded in liquefying oxygen under a pressure of 320 atmospheres by sulphurous and carbonic acids combined, at a temperature of 100° Cent.

On the next day an extract from the *Journal de Genève* was published in the same London paper, giving a somewhat detailed account of M. Pictet's experiment. Translated it was as follows:—

"One of the most interesting physical experiments of our time has been accomplished with great success in Geneva, in the laboratory of the Scientific Instrument Company. Our fellow-citizen, M. Raoul Pictet, has succeeded in obtaining, by the aid of ingeniously combined apparatus, the liquefaction of oxygen gas, one of the constituents of atmospheric air. This is briefly the mode by which this curious result has been achieved. By a double circulation of sulphurous acid and carbonic acid the latter gas is liquefied at a temperature of 65° of cold, under a pressure of from four to six atmospheres. This liquefied carbonic acid is conducted into a tube of 4 metres in length. Two combined action pumps make a barometric vacuum in this acid which solidifies, owing to the difference of pressure. In the interior of the first tube, which contains the solidified carbonic acid, passes a tube of smaller diameter, in which circulates a stream of oxygen, produced by chlorate of potash, in a cylindrical generator with egg-shaped ends, sufficiently strong to avoid all danger of explosion. The generator will resist a pressure of 800 atmospheres. Yesterday morning (Dec. 22) all the apparatus was arranged as we have indicated, and when the pressure reached 300 atmospheres, a jet of liquid oxygen spirted from



the end of the tube at the moment when the compressed and frozen gas passed from this high pressure to the pressure of the atmosphere. That which gives great interest to the experiment is the experimental demonstration it affords of the mechanical theory of heat, and aiding as it does in the proof that all the gases are vapours capable of passing through the three states—solid, liquid, and gaseous. A fortnight ago M. Cailletet succeeded in liquefying the binoxide of nitrogen under a pressure of 146 atmospheres, and at a temperature of  $11^{\circ}$  of cold. After the experience of M. Raoul Pictet in liquefying oxygen, there remain only the two gases, hydrogen and nitrogen, to experiment upon. It is intended to repeat the experiments on Monday and the following days, with some slight changes of procedure and arrangement of apparatus."

Our contemporary, *Iron*, has published a translation of a further communication from M. Pictet, and the courtesy of the Editor of that journal has placed this translation and the accompanying illustrations at our disposal.

The apparatus employed and described by M. Pictet is the following:—A and B (fig. 1) are two double-action suction and force pumps, coupled together on the "compound" system, one creating a vacuum in the other in such a way as to obtain the widest possible difference between the pressures of suction and forcing. These pumps act on anhydrous sulphurous acid contained in the annular receiver, C. The pressure within this receiver is such that the sulphurous acid is evaporated at  $65^{\circ}$  below zero. The sulphurous acid is forced into a condenser, D, cooled by a current of cold water; it liquefies here at a temperature of  $25^{\circ}$  above zero, and at a pressure of about  $2\frac{1}{2}$  atmospheres. As it liquefies the sulphurous acid returns to C, through a small tube, *d*. E and F are two pumps similar to A and B, and similarly coupled. They act on carbonic acid combined in

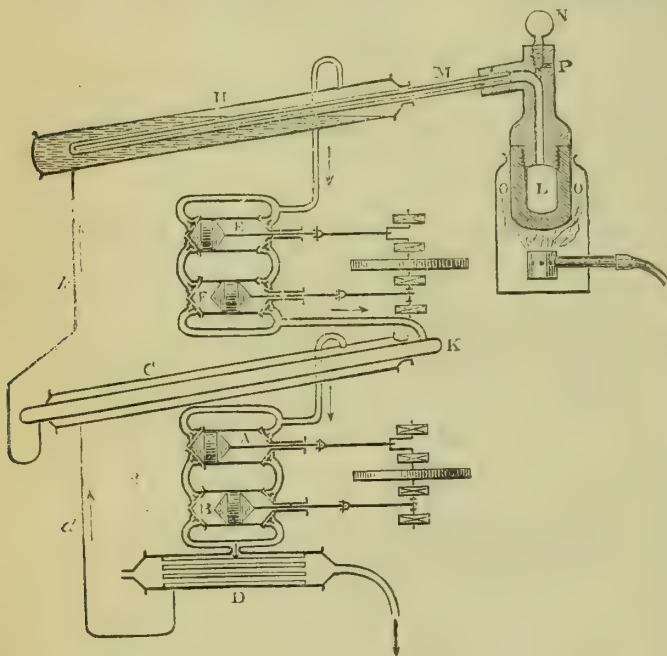


FIG. 1.

an annular receiver, H. The pressure in the latter is such that the carbonic acid is evaporated in it at  $140^{\circ}$  below zero. It is forced into the condenser, K, which is enclosed in the sulphurous acid receiver, C, which is itself at  $65^{\circ}$  below zero; the carbonic acid is here liquefied at the pressure of five atmospheres. It returns gradually, as liquefied, through the small tube K, to the receiver, H. L is a wrought-iron retort, thick and strong enough to resist a pressure of 500 atmospheres. It contains chlorate of potassium, and is heated to give off pure oxygen; its neck communicates with a slanting tube, M, made of very thick glass, and of the length of one metre, which is surrounded by the carbonic acid receiver, H, itself at a temperature of  $140^{\circ}$  below zero. A screw tap, N, commanding the channel in the neck of the retort, opens an orifice, P, which communicates with the air. After the pumps, worked by an engine of 15-horse power, have been kept in action for several hours, when all the oxygen has been given off by the chlorate of potassium, its pressure in the glass tube is 320 atmospheres, and the temperature is  $140^{\circ}$  below zero. If the orifice, P, be suddenly opened, the oxygen makes a violent escape, which produces an expansion and absorption of heat sufficient to cause a liquefied portion to appear in the glass tube and spirt from its orifice if the apparatus be laid aslant. It ought to be added that the quantity of liquefied oxygen contained in the tube, which is one metre in length and 0.01m in internal diameter, filled about two-thirds of it, and left it at the orifice, P, in the form of a jet of liquid.

Writing to M. Dumas a few days after his successful experiment, M. Pictet says: "The end at which I have been aiming for three years past is to seek to demonstrate experimentally that molecular cohesion is a general property of bodies without exception. If the permanent gases resist liquefaction, we should have to conclude that their constituent particles do not attract each other, and are thus exempt from this law. To succeed, by experimental means, in bringing the particles of a gas into intimate proximity, certain indispensable conditions have to be complied with. These I summarize as follows:—1. To have an absolutely pure gas, free from any trace of a foreign gas. 2. To have at command very powerful means of compression. 3. To get an intense degree of cold, and the ability to abstract heat at these low temperatures. 4. To have a large surface of condensation maintained at these low temperatures. 5. To be able to utilize the expansion of the gas between the compression to which it is subjected and atmospheric pressure. This expansion, added to the preceding means, compels liquefaction. These five conditions being fulfilled, we may formulate the dilemma following:—When a gas is compressed at 500 or 600 atmospheres, and kept at a temperature of  $-100^{\circ}$  or  $-140^{\circ}$ , and then allowed to expand at the pressure of the atmosphere, one of two things must happen. Either the gas, obeying the action of cohesion, becomes liquid, giving up its heat of condensation to the portion of the gas which expands and is lost in the gaseous form; or, under the assumption that cohesion is not a general law, the gas passes into a condition of absolute inertness, and becomes a dust without consistence. The work of expansion would be impossible, and the loss of heat absolute.

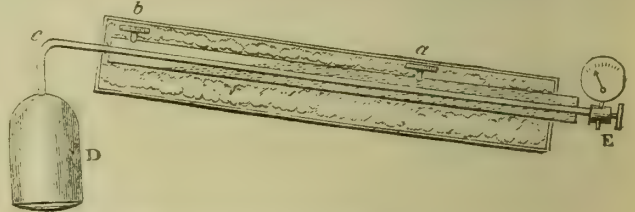
"Knowing the absolute certainty with which thermodynamic equations can be reduced to fixed numerical forms, it occurred to me to contrive some mechanical means for realizing the conditions summarized above.

The means which experiment has shown to be successful, I may describe as follows:—

"I took two suction force-pumps of the same design as those I use industrially in my ice-making apparatus. These I coupled so that the suction of the one corresponds to the compression of the other. The suction in the first communicates with a tube 1.10m. long, 12.5c. in diameter, filled with liquid sulphurous acid. Under the influence of a perfect vacuum the temperature of this liquid is rapidly lowered to  $-65^{\circ}$  or even  $-73^{\circ}$ , the extreme limit which has been obtained. In this tube of sulphurous acid there passes a second smaller tube, measuring 6 centimètres in exterior diameter, and of the same length as the tube in which it is enclosed. These two tubes have a common bottom. In the central tube I compress carbonic acid, manufactured from the decomposition of Carrara marble with hydrochloric acid. This gas was dried, then collected under an oil-gas holder containing 1 metre cube. With a pressure varying between 4 and 6 atmospheres, carbonic acid is easily liquefied under these conditions. The fluid flows down by its own weight into a copper tube 4 metres in length and 4 centimètres in diameter.

"A pair of pumps, coupled in the same way as the first pair, volatilize the carbonic acid in the gas-jar and the long tube filled with the liquid acid. Admission to the pumps is regulated by a three-way tap; a screw-regulating tap intercepts, if desired, the entry of liquid carbonic acid into the long tube; it is placed between the carbonic acid condenser and this long tube. When the regulating tap is closed, and the two pumps suck up the vapours from the liquid carbonic acid contained in the 4-metre tube, the lowest temperature is produced that can be got; the carbonic acid solidifies, its temperature going down to about  $-140^{\circ}$ . The work of abstracting heat is kept up by the pumps, which have a joint cylinder capacity of 3 litres per stroke and make 100 strokes per minute. Both the sulphurous acid tube and the carbonic acid tube are enclosed in saw-dust and baize to prevent radiation.

"In the interior of the carbonic acid tube there passes a fourth tube, 5 metres in length, 14 millimètres in external diameter, and 4 millimètres in internal diameter, which serves as the oxygen compressor. This long tube is surrounded by solid carbonic acid, and the whole of its surface is brought to the lowest temperature that it is in our power to obtain. These two long tubes are connected by the ends of the carbonic acid tube; the small tube goes beyond the other by about 1 metre. This portion I bend towards the ground, giving both tubes a position slightly inclined, but still near enough to the horizontal, as shown in the sketch, fig. 2. The small central tube is bent down at *c*, and screwed into the neck of a strong



a. Opening for liquid carbonic acid.

c. Exit of vapours, corresponding with action of pumps.

FIG. 2.

cylindro-conical retort, made of wrought iron, the walls of which are 35 millimètres thick. Its height is 28 centimètres, and diameter 17 centimètres. This retort contains 700 grammes of potassium chlorate and 256 grammes of potassium chloride mixed together, melted, then pounded, and placed in the retort perfectly dry. I heat the retort when the double circulations of sulphurous acid and carbonic acid have lowered the temperature to the point desired. The chlorate of potassium is decomposed slowly at first, but tolerably rapidly at the end of the operation. A pressure-gauge at the end of the long tube enables me to watch the pressure and the progress of the reaction. It was made on purpose for me by Bourdon, of Paris, this last summer, and is graduated up to 600 atmospheres.

"When the reaction is finished the pressure exceeds 500 atmospheres; but it almost immediately falls, stopping at 320 atmospheres. If the screw-tap, E, at the end of the tube be opened at this moment, we may distinctly see a jet of liquid escaping with extreme violence. Closing the tap we get, a few seconds later, a second jet, this time less abundant. Pieces of charcoal, kindled at a small part of their surface, placed in this jet, ignite spontaneously with incredible violence. I have not yet been able to collect the liquid on account of the force with which it is projected; but I am now endeavouring to fit a cooled epruvette, which, with the help of gauze, may enable me to collect a little of the liquid.

"Yesterday (Monday, Dec. 24, 1877), I performed this experiment a second time before a good part of the members of our Physical Society, and we had three well-defined jets, one after the other. I cannot yet give the minimum pressure necessary, for it is evident that I must have had an exaggeration of the pressure produced by an accumulation of the gas in the retort, which resisted condensation in the narrow space represented by the inner tube.

"It is my intention to attempt, with a similar apparatus, the condensation of hydrogen and nitrogen. My principal reliance is on my ability to maintain low temperatures with ease, by means of my four large pumps, worked by steam power.

"It is, I think, in this direction particularly that we have to strive to effect the condensations, which have hitherto opposed a stubborn resistance to our efforts; since the tension of saturated vapours are a direct function of the temperature. I am having a plan of my apparatus drawn up, and it will be my pleasure and duty to send it to you in the course of the week. I have learned with great interest that M. Cailletet has arrived at the same result with myself, and almost at the same moment. I have no idea as to what his process may be, but we shall doubtless be exchanging our ideas on the subject before long.

"I beg you to excuse the brevity of this description. I will by-and-by complete it by the addition of more precise details and equations, which will give these results a more scientific character."

M. Cailletet, an ironmaster at Châtillon-sur-Seine, claims also to have liquefied oxygen, and his report on the process we extract also from the columns of *Iron*:—

"Oxygen, or pure carbonic oxide, being enclosed in a tube of the form I have described in a former communication to the Academy, and being placed in the compression apparatus already exhibited before it, these gases being brought down to a temperature of  $-29^{\circ}$  by means of sulphurous acid, and at the pressure of about 300 atmospheres, those two gases retain their gaseous conditions. But if they are suddenly expanded, so as to produce, according to Poisson's law, a temperature of at least  $200^{\circ}$  below the initial temperature, we are immediately aware of an intense fog produced by the liquefaction, and perhaps solidification, of the oxygen or carbonic oxide.

"This phenomenon is observed also on the expansion of carbonic acid and the protoxide and binoxide of nitrogen when under strong pressure.



"This fog is produced with oxygen, even when the gas is at the common temperature, provided time is given for the escape of the heat it acquires by the mere act of compression. This I had occasion to demonstrate by experiments conducted on Sunday, December the 16th, at the chemical laboratory of the Ecole Normale Supérieure, before a number of scientific men, among whom were some members of the Academy of Sciences. I had hoped to find at Paris, together with the materials necessary for the production of a high degree of cold (protoxide of nitrogen or liquid carbonic acid), a pump capable of taking the place of my compression apparatus at Châtillon-sur-Seine. Unfortunately, a pump such as I wished for could not be found at Paris, and I was obliged to send to Châtillon-sur-Seine for the refrigerating material for collecting the condensed matters on the walls of the tube.

"To know whether oxygen and carbonic oxide are in a liquid or solid form in the fog, we should have to carry out an optical experiment of some difficulty, on account of the form and thickness of the tubes containing them. Some chemical reactions will also permit us to make sure that the oxygen is not transformed into ozone in the act of compression. These questions I shall endeavour to solve with the help of apparatus which I am now having made.

"Under the same conditions of temperature and pressure the most rapid expansion of pure hydrogen gives no trace of nebulous matter. I have, therefore, only nitrogen to study. The small solubility of this gas in water leads me to suppose that it will be very refractory to any change of condition."

Under date of Dec. 2, M. Cailletet had addressed the following note to M. H. Sainte-Claire Deville, a member of the Academy:—

"Without losing a moment, let me tell you, first of any one, that I have to-day liquefied carbonic oxide and oxygen. I ought hardly, perhaps, to say liquefy, for at the temperature obtained by the evaporation of sulphurous acid, *i.e.*, -29° and 300 atmospheres, I get no liquid, but a fog so thick that I may conclude it to be a vapour very near its point of liquefaction. I am writing to-day to M. Deleuil for protoxide of nitrogen, by the help of which I shall, no doubt, be able to watch the flow of a stream of carbonic oxide and oxygen.

"P.S.—I have just made an experiment of a very consoling nature. I compressed hydrogen at 300 atmospheres, and cooling at -28°, I expanded it suddenly. There was no trace of fog in the tube. My gases (CO and O) are therefore near upon liquefaction, this fog being produced only with vapours near liquefying." M. Berthelot's anticipations are, consequently, being completely realized."

#### IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE. (FROM OUR OWN CORRESPONDENT.)

There has been very little business done this week in any branch of the iron trade, and the current inquiries are on so limited a scale that the prospects of the immediate future are the reverse of hopeful. In all directions the depression is so severe that ironmasters are endeavouring to reduce the wages of their workmen, who are now in a worse position in all respects than they have been for many years past. The puddlers of the Northfield Iron Company, however, have declined to agree to a reduction of 7½ per cent.; so that the Company who had intended to reopen their works have been compelled to forego that intention, and the men, instead of having half a loaf, will have none. At the Thorncliffe Iron-Works of Newton, Chambers, & Co., the whole of the blast furnacemen of all descriptions have been served with notices for a drop of 12½ per cent., which it is believed they will accept without demur, in order to keep, as they have hitherto been, almost fully employed. At the Milton and Elsecar Works of Messrs. Dawes the plant has been idle for some time, owing to a breakdown. The men there are consequently very badly off, and there is much distress. At Sheffield and Rotherham public soup kitchens have been opened, with a view of lessening the really serious distress that exists in all directions. The Stanton Iron-Works, Derbyshire, have been transferred to a limited company, having a capital of £600,000, of which £200,000 is held by two well-known bankers—partners in the old Company.

Pig iron prices remain quiet, and must continue so until the present stocks have been very largely reduced. North Yorkshire prices at the works now range as follows:—No. 1 foundry, 48s. 6d.; No. 2 foundry, 42s.; No. 3 foundry, 40s.; No. 4 foundry, 39s.; No. 4 forge, 39s.; mottled, 38s. 6d.; white, 38s.; refined metal, 57s.; Kentledge, 42s.; and cinder, 35s.; Derbyshire and South Yorkshire brands range from 40s. to 52s. 6d.

In the coal market there is little activity in any direction, despite the fair amount of briskness that characterizes the London and house coal trades. Prices are quiet, and the supply abundant. The Manver's Main Colliery is not unlikely to be closed, and it is rumoured that a general reduction of the miners wages will presently be attempted.

#### THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is only a languid demand for all descriptions of coal, and, notwithstanding the recent stoppage of the pits for the holidays, supplies continue abundant in the market, with a great deal of pushing in inferior classes of fuel, which are quite a drug, and for which, where sales are forced, extremely low prices have to be taken. For the best classes of round coal, such as good Wigan Arley mines, although the demand is very limited, prices, as a rule, are maintained; second qualities of house coal are also steady, as there is, if anything, a better demand for this class of fuel than for the first qualities. Any descriptions of fuel below these are, however, difficult to dispose of; the common sorts of forge and engine fuel being almost unsaleable. The average quotations at the pit's mouth may be given about as under:—Best Wigan Arley, 10s. to 11s.; common Arley, 8s. to 9s.; Pemberton four-feet, 8s. to 8s. 6d.; common Wigan mines, for house-fire purposes, 6s. 6d. to 7s.; common coal, for steam and forge purposes, 5s. 6d. to 6s. 6d.; good burgy, 5s. 3d. to 5s. 6d.; common ditto, 4s. 6d. to 5s.; good ordinary slack, 3s. 6d. to 4s.; and common ditto, 2s. 3d. to 3s. per ton. In the gas coal trade there is at present little or nothing doing beyond what is required for deliveries on account of contracts.

The shipping trade continues in an extremely depressed condition. There are very few inquiries in the market either for foreign or coastwise shipments, and to secure orders prices have to be cut down to the lowest possible limits.

In the iron trade there is still but little doing, and during the past week there has been but a very small inquiry for either raw or manufactured material. Local makers of pig iron, although they report inquiries in hand, are selling very little, and for delivery into the Manchester district their quotations remain at 61s. per ton for No. 3 foundry, and 50s. for No. 4 forge, less 2½ per cent. Outside brands are without material change, north country irons being still offered in this district at very low figures. Finished is, if anything, in a more depressed condition than pig iron, and makers all through the district are very badly off for orders. Whilst foundry and engineers have, in many cases, nothing in hand beyond a little jobbing work. The average quotations for delivery into the Manchester district remain at about £6 5s. to £6 7s. 6d. per ton for Lancashire and Middlesbrough bars; £6 7s. 6d. to £6 10s. for Staffordshire; £4 6s. 6d. for Middlesbrough puddled bars; and £4 17s. 6d. for Lancashire and Staffordshire ditto; but prices, as a rule, are regulated by the nature of the specifications, and a considerable order for pipes, given out during the past week by one of the Local Boards in this district, has been placed at an extremely low figure.

#### THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

During the last week the Gas Companies began to enter upon the preliminary arrangements with the Durham Collieries for contracts to run over three, six, and nine months, and, in some instances, twelve months. Companies which have to pay a comparatively high rate of freight generally arrange for best gas coals, whereas those nearer the pits can select what they please. What may be called the official quotation for best gas coal is about 8s. per ton; but from all that can be learned, some contracts, at least, have been made at from 6d. to 1s. per ton within that figure for best. Medium qualities are quoted at about 7s. In the Durham coalfield there is a considerable quantity of coal wrought, which is used as second-class gas, second-class steam, or manufacturing coals indifferently. I stated last week that this somewhat large variety of coal was, on account of the strike in the Northumberland steam coal district, firmer, and they continue so. At the same time there was very little increase in the shipment of coals from the Tyne Dock last week; in fact, they were rather below the average of the middle of December. House coals are pretty steady in the market at late quotations—namely, 12s. to 12s. 6d. best house, and 10s. second. Though the Northumberland miners are still upon strike, and though there has been no official communication from coalowners to the miners, or from miners to owners, there has been some informal diplomacy, and, as we stated a fortnight ago, it is pretty certain that by the end of January an arrangement will be arrived at, and the Northumberland pits will be at work again. When the strike or lock-out occurred, best steam coals stood about 11s. per ton in the market. It is quite certain there will be a reduction in the wages of the workmen before they go in again. It may be the full 12½ per cent.; at any rate, it will be a substantial reduction. Under these circumstances there is every probability there will be a fall to 10s. per ton for best steam; and seconds will range from 8s. 6d. to 9s. 6d. This reduction might have an effect upon other branches of the coal trade; and as the Durham Collieries are now wrought with a sliding scale, there might be a slight fall in Durham gas coals as the days begin to lengthen again. At the present moment the best gas collieries are fully employed, and second-class pits are coming to the same standard. It is every way probable that this state of business will continue over January.

The tone of the freight market was just slightly improved last week. The gleam of hope given by the news of a proposed armistice occasioned a little more confidence in business circles; for if there should happily be peace, no doubt there will be considerable activity amongst the large fleet of iron screw steamers belonging to the North, in the spring of the year. If the Black Sea were opened, there would be a quick demand for coals from the ports which have been blockaded so long, and also a good business home. Confidence has been restored so far that no one thinks England will enter upon the war, suppose it should burst out again between the belligerents.

There is an abundance of tonnage in the market for the coasting trade. The following is the rate of freight for steamers:—London, 4s. 1½d.; Rouen, 6s. 6d.; Dublin, 6s. 6d.; Cork, 5s. 9d.; Havre, 5s. 9d.; Calais, 5s. per ton; Boulogne, £8 per keel. The manufacturers of the Tyne are doing very little forward business. What contracts have been made for chemicals over the year have been from £1 to 15s. per ton below the rates of last year. The real work of the year in the way of contracting will occur possibly in a fortnight hence, when merchants and manufacturers will be able to glean, from what has gone on in Parliament, some idea of the drift of the Eastern Question. In the meantime, affairs will go on pretty much from hand to mouth.

#### TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

At the usual Monthly Meeting of the Town Council of Renfrew, held on the 7th inst., it was resolved, on the recommendation of the Gas Committee, to reduce the price of gas from 5s. 5d. to 5s. per 1000 cubic feet.

The Police Board of Glasgow, at their last meeting, incidentally had the subject of lighting private streets and lanes under consideration. This arose out of a resolution, previously come to, to substitute No. 1 bat's-wing burners in the street-lamps for the single jet, or rat-tail burners, hitherto in use. Ex-Bailie Moir dissented from the resolution, because of the additional burden which the carrying out of the proposal would throw on the ratepayers. He was sorry to say that last year they had been out of pocket to the extent of £9000 for the lighting of common stairs and private lanes, which was solely for the improvement of private property; and he thought that between the lighting of private streets and lanes and the lighting of common stairs they would be as much out of pocket as would enable the inhabitants to adopt the Free Libraries Act without knowing that they did it. The convener stated that the burners which had been introduced into the lamps were only consuming 2 cubic feet of gas per hour, and that a great improvement had been effected by the change.

The usual report by Mr. J. F. King, on the quality of the gas supplied to the City of Edinburgh, was submitted to the Town Council, held last Tuesday. It showed that the illuminating power of the Edinburgh Company's gas was equal to 32 standard candles, and that of the Leith Company's gas stood at 27 candles.

Dr. Wallace's report on the illuminating power of the gas supplied in Glasgow during the week ending the 5th of January, shows that the minimum ranged from 25.02 candles in the northern district to 28.27 in the western; the maximum being as low as 26.76 candles in the northern district, and as high as 30.64 candles in the northern. In the southern or Tradeston district the range over the week was very trifling—average, 27.12 candles; maximum, 27.27 candles; minimum, 26.98 candles.

The Irvine Local Authority are beginning to get alarmed at the probable cost of the new water-works, which they have at present in progress. The original estimate for the works, by Mr. Leslie, C.E., was £26,500, and the sum of £24,000 had been borrowed and expended; and it was now thought that the works would eventually cost £38,000 or £40,000. Towards paying the additional cost the Joint Local Authority of the Halfway had already borrowed £7000, and the Irvine Local Authority resolved to borrow a like sum. Owing to the great cost, it is expected that the water-rate throughout the district will amount to 1s. 8d. or 2s. per pound of rental.

The total quantity of water in stock on the 1st of January for the Edinburgh and district water supply was 669,271,152 gallons, as compared with 700,678,763 gallons at the corresponding date last year, when the reservoirs were all full. The delivery was equal to 31.28 gallons per head per day to a population of 286,800.

It has been resolved by the Works Committee of the Dundee Water Commissioners to charge a uniform rate of 6d. per 1000 gallons for water



supplied by meter. Previously it was the rule to charge some consumers 4d. per 1000 gallons, and others a larger amount.

The Police Commissioners of Elgin have just been granted a supplementary loan of £2630 from the Public Works Loan Commissioners, for the completion of their new water-works.

At the last meeting of the Town Council of Musselburgh, it was resolved to give notice of their intention to borrow the sum of £14,000, being the probable cost of the water-works for a supply from Alnwick Hill; and it was announced that the Edinburgh and District Water Trust had stated to a deputation that the supply of water would be provided in less than eighteen months.

An excellent water supply scheme has just been completed for the town of Innerleithen, Peeblesshire. The water is brought into the town by means of cast-iron pipes, of a total length of 11,550 yards, and the entire cost of the works is estimated at £5000, for which there is a supply of 30 gallons per head per day for each of the population. It is expected that an annual rate of 8d. per pound of rental will be sufficient to defray the cost of the works. The scheme was devised by and carried out under the superintendence of Mr. Buchanan, C.E., Edinburgh.

The past week has been a very dull one in the Scotch iron trade. Contrary to the expectations entertained on Friday week, the price has fallen to 50s. 9d. cash, or 9d. per ton lower than was paid on the day referred to.

Reports regarding the coal trade in the West of Scotland are also still very discouraging. All descriptions of coal are very slow of sale, and at present everything seems to point to even still lower wages for the colliers.

**GLASGOW WATER SUPPLY.**—Dr. Mills, F.R.S., of Anderson's College, Glasgow, reports that the water supplied to that city, during December, from Loch Katrine, was pale brown. There were plenty of muddy particles and a few fibres.

**BIRMINGHAM WATER SUPPLY.**—Dr. Hill, the Medical Officer of Health for Birmingham, reports that the water supplied last month to that town was bright, with a few suspended particles. It was rather harder than usual, and the nitrogen as nitrates was also higher, but the organic carbon was lower.

**HALIFAX CORPORATION GAS-WORKS.**—The Gas-Works Committee have just ordered a new scrubber to be erected by Messrs. Dempster and Sons, of Elland, from a design prepared by that firm. The scrubber adopted is 60 feet by 12, and is to be fitted with machinery-room 16 feet high, and also with Dempster's spreader, tippler, and engine. It will likewise have 6-inch by three-eighths boards from top to bottom.

**GAS LIGHTING AND EXTINGUISHING BY ELECTRICITY.**—At the Metropolitan Board Meeting on Friday last, a letter was read from Mr. St. George Lane Fox, stating that the Vestry of St. James have given permission for his system of gas lighting to be applied to the lamps in Pall Mall, and inquiring whether the Board would allow the trial to be extended to the lamps on the Victoria Embankment. The letter was referred to a committee for consideration.

**MIDLAND ASSOCIATION OF GAS MANAGERS.**—The first general meeting of the above was held at the Midland Hotel, Birmingham, on Thursday, the 10th inst., under the presidency of Mr. C. Hunt, of Birmingham. There was a good attendance, and several new members were enrolled. After confirmation and adoption of rules submitted by the Committee, the President delivered his Inaugural Address, a report of which will appear in our next number. The proceedings closed with a very cordial vote of thanks to the President.

**SKELTON'S CATOPTIC LAMPS.**—Our attention has been called to a very considerable improvement which has been introduced in the construction of the reflectors for street-lamps on the catoptric principle, patented by Mr. Skelton. Heretofore the reflectors were made with silvered glass, the metallic backs being protected by various coatings. The certainty, however, of the silver oxidizing if exposed to the air, and the uncertain nature of all preservative coatings, rendered these otherwise excellent reflectors liable to deterioration and decay. Mr. Skelton appears now to have secured the most perfect durability by the use of a non-oxidizable metallized glass, having a reflective power little, if at all, inferior to that of silver, requiring no protection whatever, and not liable to be affected by expansion or contraction arising from variations of temperature. This improvement necessarily diminishes the expense of repairs very materially, and should render the use of these reflectors in the tops of all street-lamps a matter of ordinary practice.

**LOCAL GOVERNMENT INQUIRY AT NOTTINGHAM.**—On the 2nd inst., Major Tulloch held an inquiry at the Town Hall, Nottingham, consequent upon an application by the Corporation to the Local Government Board for sanction to borrow £65,000 for sewerage works. There was no opposition to the scheme, which was explained at length to the Inspector by the Borough Engineer, Mr. M. O. Tarbotton. The application was for powers to borrow the above amount for works of outfall sewerage in connection with the extended borough; and with the area comprised in the powers of the late Nottingham and Leen Sewerage Act. There were 26 large plans prepared to be laid before and explained to the Inspector. The object is to permanently divert the River Leen into the Nottingham Canal, making water-tight the River Leen and the Beck outfall sewers, so as to prevent the extraneous water from mixing with the sewage and to alter the mode of discharge of the surplus water from the canal at various points into the outfall sewers. The chief work, however, is the construction of a gravitation outfall sewer from Sneinton to Stoke Fields, three miles in length, and which will include gravitation, syphon, iron sewers, and to carry the sewer from the high levels of the town of Nottingham into the gravitation outfall; also for the construction of gauge-chambers, valves, penstocks, overflows, and sundry other necessary works. In connection with this scheme it is also intended to rent about three-quarters of an acre of land in Eborcroft, on which will be erected a pumping-station, engines, and machinery. The gravitation outfall consists of a brick sewer 5 feet 3½ inches by 5 feet from Sneinton to Carlton Station. This will be constructed for about a mile in tunnel through Colwick Hill, and will be also partly over the ground and partly in excavation, while from Carlton station to Stoke Fields it will consist of a large concrete and brick sewer in the embankment constructed on the surface of the ground to the outfall at Stoke, where, as stated during the inquiry, the sewage will be irrigated and filtered.

**METROPOLITAN SEWAGE.**—An ancient and unsavoury proverb has been justified by Captain Calver's report on the condition of the lower Thames. As might have been expected, he has drawn upon himself a vigorous attack from Sir Joseph Bazalgette; but his statements are as difficult to dispose of as sewage itself. Mr. Mechi has rushed into the controversy with his theories concerning the utilization of sewage, and there is a kind of chance that the long dead-and-gone scheme for moistening the Essex marshes with sewage will sprout again in many fertile brains. It is a most humiliating and stern fact, not to be gainsaid, that the schemes hitherto brought forward for utilizing sewage on a large scale have failed, and failed egregiously; mainly, perhaps, because too much was expected of them. The sewage of villages may, perhaps, be distributed with advantage over

the surrounding area of land under cultivation, but the mass of water in which the sewage of large towns is held in suspension is a prime difficulty in its disposition. This is a sufficiently damp country as it is, and the land will not receive the additional quantity of water sought to be thrown upon it. To dispose of the enormous mass of London sewage over farm land would cost far more money than the getting rid of it completely, and examples recently made public prove that experiments on a smaller scale are financial failures. When the Metropolitan Drainage Scheme was carried out, dreams of utilization were not yet completely dissipated, and the original idea of carrying the sewage down to the Maplin was unfortunately abandoned. It seems probable that this scheme will have to be carried out after all. There is no good reason why the foreshore of the lower Thames should not be occupied by a culvert down to the Maplin. The result would be the fertilization of a now barren and sandy tract. The effect of the system now in operation has been simply to remove the nuisance a few miles down the river, instead of hurling it into the sea at a point where it could give no offence. The engineering difficulties in the way of carrying the sewage of London down to the Maplin are very slight, and if the line of the foreshore were adhered to, the expense would not be enormous. Short cuts, involving the purchase of land, would, of course, involve unheard-of cost, and supply a stimulus to jobbery, but the simple expedient of utilizing the foreshore would obviate both the difficulties, and restore to the Thames the purity of pre-historic times.—*Iron.*

**THE THEORY OF THE RADIOMETER.**—In a recent lecture on the spheroidal state of liquids, Professor Barratt said: To Mr. Stoney is unquestionably due the great honour of being the first fully to explain the true theory of the radiometer. It was in the course of these investigations that Mr. Stoney has quite recently been led to show that the force which is so active in the high rarefaction (that is necessary for the effective rotation of the radiometer) is also present at ordinary atmospheric tensions. Now it is this force which forms the new explanation of the entire phenomenon of the spheroidal state. Prof. Barratt proposed to call it "Stoney's force." In order to understand the action that occurs, it must be recollected that, according to calculation, the number of molecules of air that at ordinary pressure occupies the space of a pin's head is 1,000,000,000,000,000; when the radiometer globe is exhausted of these molecules of air, as far as we can do it by mechanical means, there are still some few millions remaining, and these are in constant motion. Heat makes them move more rapidly, cold more slowly. If we have two surfaces very near each other, one surface hot and the other cold, from the hot surface the molecules will be thrown off with greater rapidity than they reached it; and if the cold surface be near enough, they will "bombard" it. Hence there will be a tendency in the hot and cold surfaces to retreat from one another, and when with one of these, as in the radiometer, this is possible, it ensues. This force would obviously disappear (1) if the residual molecules could be wholly removed or so lessened in number that their action would be insensible, or (2) if the surfaces were so far apart that the augmented molecular activity had expended itself before reaching the cool surface. Applying the same kind of reasoning to the spherical state of liquids, we can see that it is only at relatively short distances from the metal that the interaction will occur. A number of experiments were, in conclusion, shown, some with fluids from which there could be no vapour, such as the old theory requires, and others with fluids in which the difference in temperature was slight.

**AN OPENING FOR A GAS AGITATOR.**—At the ordinary monthly meeting of the Barton and Eccles Local Board, on the 7th inst., the question of the quality of the gas supplied to the district by the Corporation of Salford was again brought forward, a motion being made by Mr. Cowell that a competent person should be employed to test the gas "in the manner prescribed by law." The Chairman reminded the mover that when the Board waited upon the Salford Gas Committee and complained of the quality of the gas, the Committee asked them to authenticate their statements, but the Board were unable to do so. The Committee on previous occasions said, "It is very strange that you have, as you say, so many complaints, and yet you cannot authenticate them." Thereupon Mr. Bradburn, who seconded the motion, suggested that as the Board could not authenticate a single complaint, it would be well for the Clerk to write to the millowners and large consumers, and try if he could not "strengthen the Board's case." It was remarked by the next speaker (Mr. Parr) that if the millowners had any complaint they would most likely be prompt to make it without being solicited. The Clerk informed the Board that any sum which was spent in getting a test would be surcharged by the auditor, but he thought that the amount would be remitted by the Local Government Board. Mr. Gray was of opinion that if they had complaints from ratepayers, it would strengthen the hands of the Board in getting the gas tested. Unless they had evidence that the ratepayers had complained, and that they had been led by that to get the test, the Board would have very little ground on which to go before the Gas Committee with the result of such a test. The Salford authorities were spending a considerable sum of money in making improvements in the gas department, and he moved as an amendment that the Clerk should write to the Salford Gas Committee, informing them that the Board still had complaints concerning the gas supplied, and asking them for their observations on the matter. This amendment was, however, rejected, and, by a majority of two, the motion was adopted. As Dr. Angus Smith reports that the average illuminating power of the Salford gas during the last year was equal to 19.02 standard sperm candles, and it does not appear that the Salford consumers prefer any complaints, it seems difficult to understand what the Eccles and Barton Board have to complain of. Probably if the race of peripatetic "gas reformers" had not died out through sheer neglect of their pretensions, the good people at Eccles might yet be told what was the matter with them.

**THE LOUISVILLE WATER-WORKS.**—The large pumping-engines of the City Water-Works of Louisville, Kentucky, are on the Cornish plan. They are exactly alike, each working a single-acting lift and force plunger pump. The dimensions of the principal parts of the engines and pumps are as follows:—Steam-cylinder, 70 inches diameter; stroke of steam-piston, 10 feet. The beam for each engine is double; the two members, 3 feet 5 inches apart from centre to centre, are each 31 feet 10 inches long between end centres; 6 feet 9 inches deep in the middle, with 3 inch thickness of web, and 9 inches width of centre rib and outside flanges; the cylinder and pump ends of the beam are equal in length; each pair of beams weighs 42 tons. The beam vibrates on a main centre or shaft, 20 inches diameter, 9 feet 8 inches long, with journals 15 inches diameter, and 19½ inches bearing. The plunger blocks, for the beam centre of both engines, rest in pedestals bolted to a massive cast-iron entablature, which (extending transversely across the house and into the brick walls) is supported by four Tuscan columns of cast iron, standing on and anchored to the beam wall, by means of arched cast-iron bed-plates, built in the masonry. The piston-rods are guided by parallel motions, and the pump connecting-rods by cross-heads and slides; piston-rods 6½ inches diameter and 16 feet long each; pump connecting-rods 8 inches diameter and 28 feet long each. The pump-barrels are 36 inches in diameter each; plungers 36 inches diameter, with stroke same as steam-piston, 10 feet. The extreme lift of the pumps, when the river is at its lowest stage, is



21 feet 10 inches. The pumps are connected with the stand-pipe by two lines of 40-inch flanged pipes, provided each with a stop-gate near the stand-pipe. The pump-valves are of the kind known as Harvey and West's double belt-valve. The pumps and pump-mains to the stand-pipe have a circular water way of 40 inches diameter throughout, thus admitting the introduction of pump-barrels 40 inches in diameter, and increasing the present pump capacity 23 per cent. whenever the consumption of water will demand a greater supply than at present provided for. The metal (cast iron) of the pumps and pump-mains is from 2 to 3 inches in thickness, varying, as the forms vary, from the cylindrical to the oval or rectangular. All the joints are made with lead by means of flanges and bolts; the flanges are from 2½ to 3 inches thick, and from 4 to 6 inches wide, with 1½-inch bolts. Each engine is provided with a battery of three single-flue Cornish boilers. The performance of the engines has been very satisfactory. The highest daily duty (calculated by the Cornish method) was 48,963,344 lbs. of water raised 1 foot high per 100 lbs. coal; the highest monthly average was 35,957,629 lbs., and the yearly average duty 30,217,865 lbs. Cost of the engines and connections complete, 117,753 dols. 64 cents.—*Scientific American*.

**COAL AND ITS COMPONENTS.**—Professor Barff's second "Juvenile Lecture," at the Society of Arts, was delivered on Wednesday evening last. It commenced with a few experiments, showing some of the properties of carbonic acid gas, which were omitted the previous evening, owing to the pressure of time; they consisted in the decomposition of carbonic acid gas by passing it through a tube containing red-hot potassium; the gas was decomposed, its oxygen uniting with the potassium, forming potash, and its carbon was deposited in the tube as a black mass. To show its density, carbonic acid was poured from one vessel to another, as water is poured; and a small air ball was placed in a tall jar, half full of carbonic acid, when on reaching the gas it remained on its surface, suspended, as it were, in the centre of the vessel. The lecturer then gave a description of the hydrogen compounds which can be obtained by heating coal out of contact with air, and first he explained the nature of pure hydrogen, how it is obtained from water by electrolysis, how also, from the same source, by the action on it of metals at different temperatures. He placed a small piece of potassium in water, which immediately decomposed some of it, the hydrogen which was set free catching fire and burning with a violet-coloured flame. He also explained briefly the action of red-hot iron on steam. After this, hydrogen was prepared in the ordinary way, by the action of zinc on oil of vitriol diluted with water. To show the lightness of this gas it was collected by upward displacement; also, a balloon filled with it ascended to the ceiling of the lecture-room. The non-luminosity of the hydrogen flame was illustrated, and the gas used in this experiment was afterwards passed through a vessel containing benzole, whereby it was rendered intensely luminous. This gave occasion for an explanation of how gases hold liquids in suspension, and how coal gas is rendered light-giving by the presence in it, and by the combustion of certain liquid hydrocarbons set free in the manufacture of coal gas. A miniature explosion was produced by a mixture of coal gas and air, showing the danger of allowing this gas to escape into rooms, and then bringing a light into contact with it mixed with air. A gas containing carbon and hydrogen, called olefant gas, was next made, and several experiments performed with it to show the luminosity of the flame produced by burning it. Its power of uniting with chlorine and bromine was demonstrated, and an experiment was performed by passing coal gas through bromine water, which, originally brown, was discoloured by the gas, showing the presence in it of olefant gas; thus proving that olefant gas is a constituent of coal gas, and therefore a product of coal. Marsh gas was next spoken of, but was not prepared, owing to the short space of time at the lecturer's disposal. The composition of another compound of carbon and oxygen, which is obtained from coal—viz., carbonic oxide, was

given, and some of the gas burned to show its characteristic blue flame, so well known as flickering over the surface of a bright and smokeless fire. The lecturer was assisted by Mr. J. H. Pearce, B.Sc., Lond.—*Society of Arts Journal*.

## Register of New Patents.

### APPLICATIONS FOR LETTERS PATENT.

- 60.—HALL, J., Manchester, "Improvements in fluid injectors." Jan. 4, 1878.  
72.—SMITH, W., Dublin, "Improvements in rendering concrete, artificial or natural stone, waterproof and air-tight." Jan. 5, 1878.  
92.—EAST, W., Kingston-on-Thames, Surrey, "Improvements in the treatment of sewage and other waters for the purpose of purifying the same, and in apparatus employed therein." Jan. 7, 1878.  
101.—PENNEY, J., Stockport, Chester, "Improvements in ferrule taps and in the method of connecting the same to steam, gas, and water-pipes, and in apparatus employed in effecting the connection." Jan. 8, 1878.  
103.—SUGG, W. T., Westminster, "Improved apparatus for purifying illuminating gas." Jan. 8, 1878.

### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 2743.—SMEATON, W. M. and J., Strand, London, "Improved mechanical arrangements for supplying water to tilt, tip, or swing basins, said mechanical arrangements or part thereof being capable of being utilized for preventing waste, and regulating the flow of liquids for various purposes." July 17, 1877.  
2787.—TIDCOMBE, G., jun., Watford, Herts, "Improvements in means or apparatus for heating and ventilating greenhouses and other places by means of gas." July 21, 1877.  
2934.—CLARK, A. M., Chancery Lane, London, "Improvements in electric lamps." A communication. July 31, 1877.  
2982.—CLARK, A. M., Chancery Lane, London, "Improvements in electric lamps, and in the manufacture of the electrodes used therein." A communication. Aug. 3, 1877.  
3541.—JOHNSON, E., Blackheath, and ROBEY, J., Greenwich, London, "Improvements in the manufacture of a filtering medium for the purification of water and other liquids." Sept. 20, 1877.  
4252.—VAUGHAN, E. P. H., Chancery Lane, London, "Improvements in the production of combustible gases, and in the construction and arrangement of apparatus to be employed therefor." A communication. Nov. 14, 1877.

### PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

- 4410.—KIRKWOOD, J. T., LASCELLES, C. T. E., and HALL, J., "Improvements in the construction of gas-engines." Dec. 22, 1874.  
4413.—POWELL, J. W., "Improvements in apparatus for regulating and controlling the supply and flow of water and other liquids." Dec. 23, 1874.  
4486.—HASLETTINE, G., "Improvements in the manufacture of enamelled pipes, pipe couplings, and other articles or apparatus exposed to the action of gases or liquids." Dec. 31, 1874.

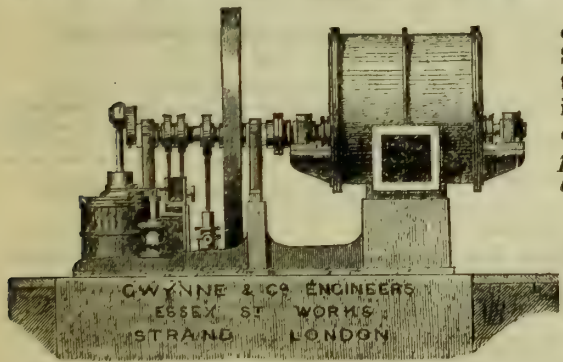
### PATENT WHICH HAS BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

- 3269.—DANCHELL, F. L. H., "Improvements in apparatus for treating sewage matter, and for filtering sewage and other water." Dec. 14, 1870.

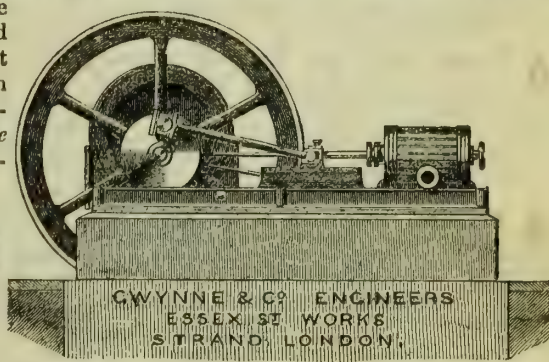
The **GRAND MEDAL of MERIT** at the **VIENNA EXHIBITION**, and **TWO MEDALS** at the **PHILADELPHIA EXHIBITION** have been **AWARDED** to **GWYNNE & CO.** for **GAS-EXHAUSTERS, ENGINES, and PUMPS**;  
Also **27 OTHER MEDALS AWARDED** at all the **GREAT INTERNATIONAL EXHIBITIONS.**

## GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.,** Hydraulic and Gas Engineers, **ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.**

G. & Co. are now making 6 Sets Exhausters and Engines for 105,000 cubic feet per hour, 3 Sets 180,000 Exhausters and Engines with many others of all Sizes.

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### D. BRUCE PEEBLES & CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

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**WANTED, Readers of the Pamphlet,**  
"Cooking and Heating by Gas," &c.  
Copies, by post, Threepence, direct from the Author,  
MAGNUS OHREN, Gas-Works, SYDENHAM, S.E.

**WANTED, for small Gas-Works near**  
Bristol, a sober Man as Working MANAGER.  
Wages 18s. per week. House, coal, and gas free.  
Apply to the Secretary, T. DAWES, Clevedon, SOMERSET-  
SHIRE.

**WANTED, a good Man for Sulphate of**  
Ammonia Making. Must take occasional light  
work.  
Address X. Z., at Horncastle's Central Advertisement  
Offices, 61, CHURCHSIDE, E.C.

**WANTED, a Working Manager for the**  
New Romney Gas-Works. There is a good  
cottage on the Works.  
Apply, stating wages, &c., and for further particulars, to  
GILBERT ALLEN, Secretary, New Romney, near Folkestone,  
KENT.

**WANTED, for the Seaham Harbour**  
Gas-Works, a practical Man for Gas-Fitting,  
Pipe-Laying, &c. Wages 27s. per week, with a free house.  
None but steady men need apply, with references, to  
- WHITE, on or before Thursday, the 17th inst.

**WANTED, Orders for Samples to test**  
the superior Silketown, Wigan, and other Gas Coals and  
Cannel on Sale by G. J. EVISON, Gas Coal and Cannel  
Contractor, BIRMINGHAM.  
N.B.—Prices on personal application, or by post or tele-  
gram, on shortest notice, and prompt delivery.

#### TO GAS AND WATER FITTERS.

**WANTED, a competent Man, capable**  
of laying Mains and Services and Internal Fittings,  
taking and testing Meters. Must have a knowledge of  
Water Meters, and be well recommended.  
Apply, stating wages required, together with references,  
&c., to E. OWEN, Manager, Gas and Water Company, Mold,  
NORTH WALES.

**WANTED, a situation as Working**  
MANAGER or FOREMAN of a Gas-Works.  
Thoroughly understands the manufacture and distribution  
of gas, main and service laying, meter fixing, and index  
taking. Can set retorts and do all general repairs. Can  
have a good recommendation from the Secretary and  
Manager of the Rickmansworth Gas-Works.  
Address J. HARDY, care of the Manager, Gas-Works,  
Rickmansworth, Herts.

**WANTED, by Samuel Thompson & Co.,**  
Colliery Office, Lancaster, APPLICATION for  
PRICES from Gas Managers who are prepared to receive  
Tenders for GAS COAL or CANNEL.  
John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his  
analytical report of S. T. & Co.'s Coal, says: "It is  
remarkable for its purity, I have scarcely ever examined a  
Coal containing so small a quantity of ash, and when Cannel  
of the best description is scarce, it may well replace this  
material."

**GAS-WORKS Contractors and Engineers**  
require efficient CLERK and DRAUGHTSMAN.  
Address WILLIAM BLEWIS and SONS, BIRMINGHAM.

**A Young Man having experience in**  
making up the Accounts of Gas Companies, and  
having also a technical knowledge of the manufacture and  
distribution, desires an ENGAGEMENT. Unexception-  
able references.  
Address No. 432, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

**A Young Man, who has had several**  
years experience in a Gas-Works, desires a  
SITUATION. Is well acquainted with the manufacture  
and distribution of gas, and has a thorough knowledge of  
chemistry. Excellent testimonials.  
Address No. 431, care of Mr. King, 11, Bolt Court,  
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#### TO GAS ENGINEERS.

**A Practical Engineer, with large ex-**  
perience in the construction and designing of Gas  
Apparatus, Roofs, and General Engineering, desires an en-  
gagement as CHIEF DRAUGHTSMAN or ASSISTANT  
ENGINEER.  
Address H., Waterloo Terrace, New Hampton Road,  
WOLVERHAMPTON.

#### SUPERINTENDENT OF GAS-WORKS.

**THE Directors of the Gravesend and**  
Milton Gaslight Company are about to appoint a  
SUPERINTENDENT of their Works at Gravesend. He  
will be required to have a thorough practical knowledge of  
Gas Machinery and Works, and the manufacture of Gas,  
and also to have had experience in the actual working of  
Gas-Works.

Particulars of the duties of the office can be seen at my  
Office, 27, King Street, Gravesend, or can be had upon  
application, enclosing stamped addressed envelope for return.

The salary will be £200 per annum, with house at the  
Works, coals, and gas.

Letters from candidates, enclosing testimonials as to  
character, ability, and previous service (which testimonials  
will be returned on application and enclosure of stamps),  
must reach me on or before Wednesday, the 30th of January  
next, after which date an appointment will be made with  
those candidates whose attendance may be required before  
the Directors.

TUFNELL SOUTHGATE, Secretary.

Gravesend, Jan. 10, 1878.

#### REMOVAL.

**CHARLES HEISCH, F.C.S., Analytical**  
and Consulting Chemist, Superintending Gas  
Examiner to the Corporation of London, &c., &c., has  
MOVED from 8, Savage Gardens, to 79, MARK LANE,  
where he may be consulted as usual.

**ON SALE—One Station-Meter, to pass**  
1000 cubic feet per hour. Almost new. Will be sold  
cheap.  
Apply to J. HALL, Gas-Works, St. Helen's, LANCs.

**FOR SALE, One Gasholder, 33 ft. by**  
14 ft., with cast-iron tank, columns, girders, inlet  
and outlet pipes, and valves.  
Apply to Mr. JOHN BUDDEN, Gas-Works, Poole, DORSET.

**TO BE SOLD, together or in Lots,**  
THIRTY SHARES, of Ten Pounds each (fully paid  
up), in the King's Lynn Gas Company, established by  
special Act of Parliament.  
Apply to Messrs. HARWAR AND CO., Furnival's Inn,  
LONDON, E.C.

**T. V. CLARKE & CO., Trundley Lane**  
Wharf, Surrey Canal, Deptford, S.E., are BUYERS  
of Tar and Ammoniacal Liquor; also of Sulphate of  
Ammonia.

#### SECOND-HAND SCRUBBER WANTED.

**THE Directors of the Lurgan Gaslight**  
Company wish to PURCHASE a good Second-hand  
SCRUBBER for their Works. The quantity of Coals used  
is about 1200 tons per year.

Parties wishing to offer will please state the dimensions,  
how long in use, name of maker, and price.

By order,

WILLIAM BAIRD, Secretary.

Lurgan, Jan. 7, 1878.

#### GAS PLANT FOR SALE.

**THE Directors of the Newcastle and**  
Gateshead Gas Company have FOR SALE the fol-  
lowing ARTICLES lately used at the Gas-Works, Blaydon  
viz.:

One Scrubber, 18 ft. high and 8 ft. diameter.  
Set of Condensers, consisting of six 14-in. pipes, with  
bridge-pipes.

Three Purifiers, 7 ft. 6 in. square, and lifting apparatus.  
21 5-in. Ascension-Pipes.

54 ft. Hydraulic Main, D-shaped, 18 in. by 18 in.  
One Gasholder, 35 ft. diameter.

Four Columns for do.  
One Station-Meter, 5-in. inlet.

One Governor.  
With other necessary connexions, all of which may be  
seen at the Gas-Works, Blaydon.

Further particulars may be obtained from the under-  
signed, to whom written offers, either for the whole or  
part, should be sent on or before the 29th inst.

WM. HARDIE, Secretary.

Neville Street, Newcastle-on-Tyne, Jan. 2, 1878.

#### BOROUGH OF BARROW-IN-FURNESS.

**THE Corporation are prepared to**  
receive TENDERS for a GASHOLDER of 125 ft.  
diameter, and the ironwork connected therewith.

The plans and specification may be seen, and all neces-  
sary information obtained, of the Manager, at the Gas and  
Water-Works, on and after the 22nd inst.

Sealed Tenders, addressed "The Chairman of the Gas  
and Water Committee," and endorsed, to be delivered at  
the Municipal Offices not later than Jan. 29, 1878.

The lowest or any tender not necessarily accepted.

By order,

C. F. PRESTON, Town Clerk.

Municipal Offices, Barrow-in-Furness,

Jan. 11, 1878.

#### TO GASHOLDER MAKERS, &c.

**THE Directors of the Northampton Gas**  
Company are prepared to receive TENDERS for a  
Telescopic GASHOLDER, 100 feet diameter by 30 feet  
deep.

Plans and specifications may be seen at the Offices of the  
Company on and after Monday, Dec. 31, and copies of the  
specification and particulars may be obtained on payment  
of One guinea.

Tenders, addressed to the Chairman, endorsed "Tender  
for Gasholder," to be delivered at the Office of the Com-  
pany on or before Wednesday, Jan. 24.

The Directors do not bind themselves to accept the  
lowest or any tender.

JOHN EUNSON, jun., Engineer.

Northampton, Dec. 21, 1877.

#### TO IRONFOUNDERS & GASHOLDER BUILDERS.

**THE Directors of the Devonport Gas**  
and Coke Company are prepared to receive TENDERS  
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HOLDER and Iron TANK, about 80 ft. diameter and 24 ft.  
in depth.

Plans and specifications may be seen at the Offices of the  
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cation. Drawings of the set of drawings will be forwarded  
on receipt of P. O. order for One Guinea.

Tenders are to be sent in on or before Monday, the 28th  
inst., endorsed "Tender for Gasholder and Tank" and  
addressed "To the Chairman, Devonport Gas and Coke  
Company, Devonport."

The Directors do not bind themselves to accept the  
lowest or any tender.

JOHN WILLING, Secretary.

Devonport, Jan. 1, 1878.

#### DEVIZES CORPORATION WATER-WORKS.

##### CONTRACT No. 5.

RESERVOIR, ENGINE-HOUSE, &c.

**THE Town Council of the Borough of**  
Devizes (acting as the Urban Sanitary Authority) are  
prepared to receive TENDERS for the construction of a  
Covered RESERVOIR, ENGINE and BOILER HOUSES,  
and other Works connected with the above Contract.

Plans and specifications may be seen at my Office in  
Devizes, or at the Office of the Engineer, Mr. Henry Tom-  
lison, 4, Bene't Street, Cambridge, and bills of quantities  
can be obtained on payment of One Guinea each.

Tenders (endorsed "Water-Works, Contract No. 5")  
must be sent to me on or before Monday, the 21st inst.

The Corporation do not bind themselves to accept the  
lowest or any tender.

A. GRANT MEEK, Town Clerk.

Devizes, Jan. 2, 1878.

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(JULY to DECEMBER, 1877.)

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**THE Directors of this Company invite**  
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outer lift to be 50 ft. 6 in. in diameter.

Tenders, marked "Tender for Gasholder," to be sent to  
the Secretary on or before Saturday, the 26th of January  
inst.

The lowest or any tender will not necessarily be  
accepted.

The plans and specification may be seen at the Secretary's  
Office, at Staines, and further information obtained of him,  
or of the Manager, at the Gas-Works at Egham.

JOHN ANTHONY ENGALL, Secretary.

Staines, Jan. 4, 1878.

#### TO BUILDERS AND IRONFOUNDERS.

**THE Buxton Local Board invite Tenders**  
for the following Works:—

1. The erection of superstructure of Retort, Coal, and  
Coke House, &c., in Ashwood Dale, Buxton.

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Retort-House and Stores, Cast-Iron Beams and Columns  
in Floors, &c.

Bills of quantities may be had, and plans and specifica-  
tions seen, at the Gas-Works, Buxton; at the Offices of the  
Engineer, Mr. Henry Lyon, Barton House, Deansgate,  
Manchester; or at Messrs. Mestayer and Gunson's, Archi-  
tects and Surveyors, Marsden Street, Manchester.

Tenders, endorsed "Gas-Works No. 1 or No. 2," as the  
case may be, to be sent in, addressed to the Chairman of  
the Gas Committee, on or before Thursday, the 24th inst.

The Board are not bound to accept the lowest or any  
tender.

By order,

JOSEPH TAYLOR, Clerk.

Local Board Office, Buxton, Jan. 7, 1878.

**DUKINFIELD AND DENTON JOINT  
GAS-WORKS.**

#### TO IRONFOUNDERS.

**THE Committee of the above Company**  
are prepared to receive TENDERS for the supply of  
the following Cast-Iron PIPES, with turned and bored  
joints, to be delivered at Ashton and Denton Stations as  
required:—

2550 yards of 8 inch, in 9 feet lengths, more or less.  
1550 " 8 " 12 " " "  
1550 " 10 " 9 " " "  
1550 " 10 " 12 " " "

All to be coated with Dr. Smith's solution, and weight per  
yard to be duly specified.

Further particulars may be obtained on application to  
the undersigned, to whom tenders are to be sent, endorsed  
"Tender for Gas-Pipes," on or before Monday, Jan. 28, 1878.

The Committee do not bind themselves to accept the  
lowest tender.

By order,

WILLIAM BRIDGE, Gas Manager.

Gas Offices, Dukinfield, near Manchester,

Jan. 14, 1878.

**TO HYDRAULIC, GAS, & HOT-WATER ENGINEERS,  
FIRE-ENGINE MANUFACTURERS,  
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Auctioneer, 64, King William Street, LONDON BRIDGE, E.C.



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TO SUBSCRIBERS.

The JOURNAL OF GAS LIGHTING is supplied direct from the Office to residents in any part of the United Kingdom, at the rate of 21s. per annum, payable in advance. If credit be taken, the charge is 25s.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 22, 1878.

Circular to Gas Companies.

THE rage for the purchase of gas undertakings by Local Authorities still continues unabated. In the present session of Parliament, ten Bills are promoted either to effect compulsory purchases, or to confirm agreements already entered into. In most cases the terms and considerations have been arranged between the two parties, and the Bills will pass into Acts, as a matter of course. In one or two, however, severe parliamentary contests may be anticipated. The two principal purchases for which confirmation is sought are Leicester and Limerick. In the former instance, terms, which might almost be deemed liberal, have been settled between the Directors of the Company and the Corporation. In the Limerick case, the terms of purchase are also settled, and no opposition is likely to be raised to the passing of the Act,

which will transfer to the Limerick Corporation the last undertaking of the United General Company.

The Town Council of Bangor and the Gas Company are hopelessly at variance as to the value of the gas undertaking. We may assume that the Corporation will proceed with their Bill to effect a compulsory purchase, and we may anticipate a strong contest before the Committee. The decision in this case will show us how far Parliament are disposed to lend themselves to the cant of the day, which preaches that gas and water, being necessities of life, should be supplied by Local Authorities. Last session Compulsory Purchase Bills were not particularly successful. Much as we object to the possession of commercial undertakings by Local Authorities, there is nothing to be said against it when the transfer is obtained by fair means, and on equitable terms. We entertain, however, the strongest prejudice against compulsory purchases. The only gratifying fact connected with them is that, in the few cases which have happened, the Companies have obtained a liberal consideration for their property, and if the Bangor Company can give any proof that the value of their undertaking is what they represent it, we believe they may safely rely upon the justice of a Parliamentary Committee to reject a Compulsory Purchase Bill, or to secure them the terms they ask.

The transfer of the undertaking of the Newbury Gas Company to the Corporation will be effected under very peculiar circumstances, which do not often occur in this country. It seems that the Company erected their works on lands belonging to the Corporation, of which they obtained a lease, which expires this year; and they agreed, at the expiration, to sell the undertaking on a valuation, without reference to the business attached thereto. The bargain was a very bad one; but the Company must stand by it. We only hope that in the course of the fourteen years in which the Company have been in existence, the Shareholders have received good dividends. They will now get expended capital back, *minus*, possibly, a considerable sum for depreciation of plant. The case may, however, go to arbitration, and perhaps the Company may secure good terms. Fourteen years is far too short a period for a concession of this kind to endure. We do not remember any Continental City in which so short a period has been fixed. A case of the kind is not likely to occur again; but if it should, we recommend the Gas Company not to accept anything less than a twenty-five years lease.

The Newry Gas Bill is intended to effect a compulsory purchase of the Newry Gas Company, who are accused in the preamble of failing to adequately supply the town and neighbourhood. Of course, if this charge be substantiated, the Company can have no defence against their confiscation, but we always read preambles of Bills with a certain amount of suspicion, and we hope the Newry Company may be able to rebut the charge brought against them, "that their arrangements for the supply of gas to the town of Newry and its neighbourhood are inadequate and unsatisfactory, and much inconvenience is thereby occasioned to the inhabitants."

The West Houghton Local Board cannot come to terms with the West Houghton Gas Company, and unless arrangements are made in the interim, there will be another small parliamentary contest. But for the fact that the matter involves a great principle, it would be unworthy of notice. As, however, the Local Board are attempting to make a compulsory purchase, the case is of interest, and we shall watch the proceedings with care. The case will probably go to arbitration.

Next week we shall begin our usual abstract of the Bills to be presented this year. But, so far as a cursory glance over these documents enables us to judge, the present session will be a dull one, so far as gas legislation is concerned. The only burning questions likely to arise we have referred to above. The Bills for the incorporation of Companies, and for conferring further powers on Companies already incorporated, will, we may anticipate—except in a very few instances—be passed without opposition. The Bills promoted by Municipal bodies for extension of works, and for borrowing powers for the purpose, pass, as a matter of course; so that the Committee work of the year, in relation to gas matters, will probably be very light. Our columns will suffer accordingly, but they will probably be filled by endless discussions on water questions.

We do not know Whitwood, but it appears at the present time that the district is partially supplied with gas from the private undertaking of Messrs. Briggs and Co., with which the inhabitants seem perfectly satisfied. Three other parties will, however, in the present session, contend for the honour of illuminating the district. There are, for instance, the Local Board of the neighbouring district of Castleford, who are seeking power to borrow money for the erection of new works for the supply of



their own district and that of Whitwood as well; there are the Castleford and Whitwood Gas Company, Limited, who are seeking incorporation, with power to supply Whitwood; and then there are also the Normanton Gas and Water Company, who are seeking incorporation, with power to supply Whitwood with the former commodity. At a meeting of the ratepayers of Whitwood it was resolved almost unanimously to oppose the Bills of the Castleford Local Board and the Normanton Gas and Water Company. Thus the Bill of the Castleford and Whitwood Gas Company obtains an indirect support, while Messrs. Briggs and Co. are left in possession of the ground they occupy. The vote at the ratepayers meeting will apparently sanction the expenditure of money in opposing the two Bills mentioned above. Whitwood is evidently not in love with its neighbouring Board, and we shall be glad if their disunion result in the success of the Gas Company.

Featherstone loves darkness rather than light. There are gas-mains running through portions of the district; but the Local Board will not put up public lamps. There is a detestation of rates at Featherstone as well as elsewhere, and failing the power to inflict a special rate on the particular district interested, the Board have resolved to leave it in darkness.

Vague accusations against Gas Companies are too common, and are frequently brought against Corporations also having gas undertakings. We can easily believe that the Corporation of Leeds have not bestowed all the enterprise they might in replacing the small mains of the Companies with others, larger and better adapted to supply the needs of the day; but those who complain of a deficient supply of gas should have a little patience. The Corporation and their Manager, we are convinced, are doing their best, and, in good time, all grounds of complaint, if any really exist, will be removed.

The Bill of the Farnworth and Kearsley Gas Company may possibly be opposed by the Local Authority of the district. Most ridiculous complaints are made by men who, if the results of the consumption of gas on their premises be true, must have stuffy workshops and ill-ventilated houses. The worst gas ever made in the early days of gas lighting could not produce the effects which some members of the Farnworth Local Board allege to ensue from the combustion of that now supplied in the district of the Company. The joke is that in the early days of gas lighting, when scarcely any means of purification were resorted to, no complaints were made. It is only in these days, when quacks are prevalent, that Gas Companies are harassed by incessant grumbings about the quality of the article supplied so regularly and so cheaply.

The Commercial Gas Company are running the risk of still further persecution. They are depositing foul lime on the soil around the Bromley works, and an Inspector of Factories complains that the emanations from it are offensive and injurious to health. What an Inspector of Factories has to do with it we do not exactly understand; but, as he appears to be backed up by a Medical Officer of Health, we suppose there is some odour to be complained of. The remedy to be applied is a very simple one, and only involves a little labour. The fresh-fouled material, as it is shot out, has only to be covered up with an inch or two of weathered lime, and all stench will be prevented. Fouled lime oxidizes with extreme rapidity, and in a few hours offence is removed. We have seen a mountain of lime treated as we have mentioned almost in the heart of a town, and no complaints have been made.

We publish, according to promise, the Inaugural Address delivered by Mr. C. Hunt to the members of the Midland Association of Gas Managers. It will be found, as we have intimated, of considerable interest. We are glad to see that Mr. Hunt fully recognizes the claims of the parent body—the British Association of Gas Managers. The only objection we can reasonably bring against these Provincial Associations is, that they may possibly tend, we can hardly say to damage the interest, but, if we may be allowed a vulgarism, to take “the shine” out of the proceedings of the parent Association. Members cannot bring novel suggestions to the two Institutions, and the impression is forced upon us that every communication to a Local Association is, to a certain extent, a deprivation to the British meeting. Much has still to be done in perfecting both the manufacture and the purification of gas, and Gas Managers cannot too often meet together and compare notes on new methods of procedure. We quite agree with Mr. Hunt in the remarks he makes on carbonization. We firmly believe that heavy charges and long heats are a mistake, but then comes the labour question. In some form or other, mechanical stoking must come to our aid. The Foulis machine is an admirable one, but, in our ignorance, we believe it would be better if worked with compressed air instead of water. Mr. West's machine,

simple and inexpensive as it is, is only adapted for use in comparatively small works. Both these machines, and probably others, which may or may not be improvements, will eventually find their way into use with advantage. As regards purification, we again agree with Mr. Hunt in thinking that the products of the distillation of coal are quite sufficient for the purification of the gas evolved. We have the purifying material, ammonia, in abundance, and it only remains to be settled in what manner it can be employed to the best advantage. There is, of course, the question whether it is financially more advantageous to a Gas Company to employ ammonia over and over again as a purifying agent, or to convert it at once into sulphate of ammonia, and sell it to a farmer. But no such question can arise in the Metropolis, where purification is rigidly insisted upon. Mr. Hunt is perfectly right in asserting that the principal object of a Gas Manager should be to cheapen production, but something more is required. He should at the same time aim at procuring gas of an increased illuminating power. Here in London, for instance, we are now threatened with an agitation for eighteen instead of sixteen candle gas, to be supplied at the price charged for sixteen. At the present time, the thing is impossible; but we will not say that cheap coals and improved manufacturing methods might not make the demand reasonable. What we wish to particularly impress on Corporations and Companies is, that they should give their Managers latitude for experimentation. A few hundred pounds spent on trials need not affect a dividend or increase the rates.

In another column will be found a short report of the visit paid by a party of gentlemen to the oil gas manufactory of Messrs. Pintsch and Co., Stratford. It turns out that this exhibition was preliminary to the issue of a prospectus, announcing the formation of a Limited Liability Company to take over the business of the firm mentioned, so far as England, India, and the English Colonies are concerned. The merits of the system cannot be doubted; but we rather think the value of the light is somewhat exaggerated. Compared with oil-lamps, the light is certainly more brilliant, and cheaper, while a vast amount of labour is dispensed with. We, of course, express no opinion on the terms of purchase which are proposed. For some reason or other, English Railway Companies, for the time, decline to adopt the system. The example of the Great Eastern Company may, however, soon be followed by others, and then the newly-formed Company may do a very remunerative business. At present we cannot say that we are perfectly satisfied with the light. A larger burner, we think, should be used, and a manufacturing station arranged at each terminus. It must be admitted, however, that it possesses great advantages. It differs but little from the system in use on the Reading and Philadelphia Railway, of which we propose, in a week or two, to give our readers plans and a description.

### Water and Sanitary Notes.

SIR J. M. HOGG has lost no time in introducing the Metropolitan Water (Purchase) Bill, which was read the first time on Friday evening last, and referred to the Examiners. The companion measure is necessarily left for the moment in abeyance, and it may be that we shall hear nothing more of it. The two Bills ought, however, to go before the same Committee.

The Government, we may expect, will on this question observe a strict neutrality, and thus the Bills will be left to take their chance with the numerous other measures which have so early been brought forward. It is probable, however, that a second reading will not be long delayed, and, if an adverse division be not arrived at on that second reading, the great fight before a Select Committee will soon commence. That the Metropolitan Water Companies will make a stout resistance to their confiscation is certain, and opposition to the Purchase Bill is likely to spring up from other quarters. As regards the second Bill, for furnishing an independent supply of water for potable purposes and the extinguishing of fires, it may be expected a very powerful opposition will be organized. There is a strong opinion in the Metropolis that the supply is not needed, that it would prove very costly, and that it would produce an immense amount of discomfort in the Metropolis for several years. Meantime, opposition is springing up outside the Metropolis. The Local Board of Uxbridge have taken alarm at a proposal of the Metropolitan Board to sink at Denham and Hayes wells, which it is supposed may have the effect of draining the Uxbridge wells, and a meeting of ratepayers has sanctioned the expenditure of the money necessary for opposing this scheme. It was, however, cautiously recommended that, before engaging in active opposition, the Uxbridge Local Board should consult with the Metropolitan Board, and



endeavour to arrive at some amicable arrangement for the protection of the water supply, and for the interest of the district. If we suppose the scheme to be carried out, the Metropolitan Board could easily give compensation water to the Uxbridge Authority; but the success of the scheme is so improbable that we need not speculate on what would be necessary if the Uxbridge wells were drained.

The broader question, as to whether the Metropolitan Board are a body who can be safely trusted with the water supply of London, is sure to be raised, and will, we believe, be answered in the negative. The conduct of the vast business connected with the water supply of the Metropolis would be altogether beyond the limited ability of the forty-six gentlemen who are even now overburdened with work. The amount of labour required from a small Committee, to do the business now transacted by eight Boards of Directors, would be simply enormous, and utterly beyond the means of gentlemen who, besides conducting public affairs, have to earn their own livings. A differently constituted Board, or a Metropolitan Municipal Council, might better cope with the difficulties, and we anticipate that, to one or the other of these, the vexed water question will eventually be relegated.

The Annual Report of Captain Shaw, the Superintendent of the Fire Brigade, was presented at the meeting of the Metropolitan Board on Friday last. It gives the total number of fires at 1533. For the extinguishment of these, it is reported—but it can be little better than a guess—that but fourteen and a half million gallons of water were required, only half of which was drawn from the mains of the Water Companies. Seven millions of gallons only represents about one-seventeenth of the daily supply furnished by the Water Companies, and, therefore, it is absurd to assert that the resources of the Companies are not adequate to supply water sufficient for the extinguishing of fires. Deficiency of water, it is stated, occurred only in nine cases. Late attendance of turncocks is reported to have happened in thirty-three cases. As regards these, it must be said that the Metropolitan Board are entirely responsible for them. The Water Companies offered to lodge the turncocks at the Fire Brigade stations, and to pay for their lodgings; but the Board would not allow it.

We are much astonished that no mention of hydrants is made in Captain Shaw's report. Those fixed in the City of London have already proved of great efficiency. The City of London will, in a comparatively short time, be completely furnished with hydrants, provided with all necessary adjustments, and a much longer time cannot elapse before the whole Metropolis is supplied with them, the Metropolitan Board notwithstanding.

The Social Science Association have occupied themselves with the Metropolitan Water Question, and in another column will be found a very interesting paper on the subject read by Mr. Lewis Angell. The discussion which followed shows that the scheme of the Metropolitan Board finds but little favour. We were, however, somewhat astonished to see the almost-forgotten Bag-shot Sands scheme revived, and put forward as a substitute for the deep well scheme proposed by the Engineers consulted by the Metropolitan Board. The opinion of the meeting, too, seemed adverse to endowing the Metropolitan Board with the control of the water supply, and in general appeared in favour of the continued existence of the Companies. Mr. Edwin Chadwick, C.B., has, of course, no sympathies in common with the Metropolitan Board. He would naturally desire to see the administration of the water supply in the hands of three paid Commissioners and a Secretary, and we really should not be surprised if some plan of the sort were adopted. We shall not prophesy, however; time is passing away, and although we do not expect to see the Metropolitan Water Question settled this session, we shall, before long, know enough of the opinions of Parliament to enable us to make a shrewd guess as to what will be the ultimate solution.

The Manchester Corporation are adopting the tactics of the Corporation of the City of London, and have sent a begging letter to all the other Corporations in the kingdom, asking them to support Municipal rights, and petition in favour of the Thirlmere Scheme, which Manchester supposes to be endangered by the threatened opposition. This is pure nonsense, and the proceeding is very undignified. The scheme must rest on its own merits. Manchester wants water, and must have it from some source or other; and when the Corporation decide that Thirlmere is the best source to have recourse to, they have only to push forward their project with all the strength they possess. Petitions from all the little boroughs in the kingdom will not help them in the least.

Notice of motion has been given by Mr. E. Howard, the Member for East Cumberland, to the following effect:—"Select Committee to inquire into the supply of water to the manufac-

turing districts of Lancashire and the West of Yorkshire, and any deficiencies likely to arise therein; and whether it is necessary or expedient to resort to the Westmoreland and Cumberland Lakes to make good any deficiencies in such supply; and if so, to what extent, and under what conditions such resort should be sanctioned." The terms of this motion are rather vague, and we are uncertain whether or not it is intended to be antagonistic to the Manchester scheme. We rather think the object of the mover is to obtain an opinion from the House of Commons to the effect that what we may call the superabundant water of the Cumberland and Westmoreland Lakes belongs to the whole of, and more especially to the north of, England, and that, if the Lakes be tapped, a number of towns should be allowed to participate in the generous supply. Oldham and other towns desire to share in the supply from Thirlmere, and there can be no reason why they should be denied the advantage. If Mr. Howard's object is to advocate the rights of these towns to share in the advantages of a superabundant rainfall in a remote district, we cordially agree with him. Windermere, Ulleswater, and Thirlmere, can give a supply of water to the whole of the North of England; but the cost of obtaining such a supply would be enormous, and the outlay would only be justified by combination. We must wait, however, to learn what Mr. Howard exactly means by his motion. Taken alone, the Manchester Corporation have one pre-eminent quality—they contrive to make everything pay; and if the Thirlmere scheme did not promise, on full consideration, to be remunerative, we may be certain they would not embark in the speculation. The leading members of the Corporation of Manchester are business men. Under the conduct of Aldermen Curtis and King the Gas-Works have proved extremely remunerative, and although it cannot be expected that the extended water supply will prove of equal value, we may safely anticipate that it will be made at least self-supporting.

#### LIGHTING OF RAILWAY CARRIAGES.

ON Wednesday last a party of gentlemen, mostly connected with the railway interest, visited the newly-erected works of Messrs. Pintsch and Co., Stratford, to witness their mode of manufacturing oil gas, and applying it to the lighting of railway carriages. The works are situated near a siding on the Great Eastern Railway, which Company are gradually introducing the light into all their carriages. We have before described the nature of the gas and its mode of manufacture, and need here only recapitulate the fact that the gas is formed by causing a thin stream of oil—the commonest petroleum residues are mostly employed—to trickle over plates of iron kept at a bright red heat. In this way about one-third of the oil employed is converted into permanent gas, the illuminating power of which ranges from forty to fifty candles. The gas is subsequently compressed into cylinders, at the pressure of about ten atmospheres. The railway carriages are fitted with cylinders of a similar kind. When one is required to be filled, it is brought alongside in front of the works, and, by means of a stand-pipe and a stout india-rubber hose, the gas is conveyed into the cylinder underneath the carriage. Necessarily some loss of pressure results, and, as a rule, the pressure in the cylinders attached to the carriages does not much exceed six atmospheres. The capacity of the cylinders is, however, such as to contain sufficient gas to light a carriage continuously for more than thirty-six hours. Messrs. Pintsch and Co.'s invention has now been adopted by seventeen Railway Companies—two in this country and fifteen on the Continent. Trains run regularly between Berlin, Paris, Calais, and Ostend, and the double journey only necessitates the refilling of the cylinders at Berlin. We have before informed our readers that, on a trial on the London and North-Western line, a carriage travelled from London to Aberdeen and back without requiring any renewal of the gas store. The advantages of this system to Railway Companies are very obvious, as any one who takes long journeys may perceive. Its economy is undoubted. The cost of each light is about half-a-farthing per hour for the gas. The consumption is estimated at one-sixth of a foot per hour, and no labour is required along the line travelled over. Taking coal gas at 3s. 6d. per thousand, and the estimated consumption at three feet per hour, the economy is not very apparent; but then the cost of labour has to be taken into consideration. The Pintsch system requires no labour, except at the central station. Nearly the whole of the gas used on the continental lines is supplied at Berlin, where alone special workmen have to be employed.

The works at Stratford contain but four retorts, by which, supposing them to be worked in shifts night and day, sufficient gas may be made for fifteen hundred carriages. There are five large cylinders, into which the gas may be compressed for transference to the cylinders under the carriages. The exit of the



gas from these latter cylinders is controlled by a regulator of great delicacy. The gas within the cylinder being at a pressure of, say, six atmospheres, it is supplied to the burners at a pressure of six-tenths of an inch of water. There is also some peculiarity in the construction of the lanterns, of which we are not fully informed. The flame is completely protected from draught, and burns, under all circumstances, with wonderful steadiness. We were informed that not long ago a carriage fitted with these lamps was in Holyhead Harbour exposed to a very severe gale, and when all the oil-lamps in the carriages, and even the guard's lanterns, were blown out, the Pintsch lamps continued to furnish a perfectly steady flame. Whatever may be thought of the comparative light afforded by these lamps and that yielded by the coal gas-lamps used on the Metropolitan Railway, and the oil-lamps used on the long lines, there can be no doubt the invention offers great advantages to Railway Companies, and we may expect to see its adoption greatly extended.

#### HEALTHY AIR.\*

This is, unfortunately, a book which mainly concerns Americans, but a similar work, devoted to the careful consideration of the conditions conducive to health in the British Isles, would be extremely welcome. A good many authors have speculated upon the temperature and the hygrometric conditions of the air which produce the most comfort to the human body. The temperature speculated upon varies from 48° to 70° Fahr., and the moisture from 30 to 80 per cent., of the point of saturation. If, then, according to these authorities, we could only keep the air within these conditions, everybody should be happy and comfortable. Pneumonia should be unknown, bronchitis never heard of, and no child should suffer from chilblains. Unfortunately, however, so perverse is Nature, that we can never ensure a continuance of the state of things which we are told leads to health and comfort. Under some circumstances we get a dry air, which produces much discomfort, and under others we have a too moist air, which is extremely oppressive. These things are to a great extent beyond human control, but Mr. Briggs shows that much may be done indoors to keep the temperature and moisture of the air within limits. If we could live in glass houses in winter, and nobody would throw stones and interfere with our proper means of ventilation, we might thoroughly enjoy ourselves. But as most of us must go into the open air, and encounter the chills of winter, and suffer from the extreme heats of summer, we fear that we must continue to bear the ills which climatic conditions impose. Indoors, however, as Mr. Briggs shows, by proper means of ventilation much may be done to preserve air and moisture at a proper level. He estimates that the air of an apartment must be renewed at the rate of from 40 to 60 cubic feet per minute for each occupant of the room. The estimate appears to us rather high, but we are fond of fresh air, and do not find fault with the author. The amount of moisture is to a great extent independent of our control. It is furnished by a variety of means, not the least important of which is the exhalation from our own bodies. This exhalation may be said to be the most important element in the regulation of the external heat of the body, and here we quote a passage which explains in a few words how this warmth is regulated:—

There are three means provided for the healthful dispersion of animal heat into the atmosphere; the first is radiation to surrounding colder objects; the second, conduction to the atmosphere, which, for comfort, must be sensibly cooler than the body; and the third is evaporation from the moist surfaces of the lungs, throat, and the roots of the pores of the skin. The first of these means, to the clothed person, at least, is comparatively ineffective, while the relative quantities of heat which may be eliminated in any given time or locality by the two last will probably be found nearly equal in an atmosphere of about 70° temperature, and 65 to 70 per cent. of humidity. In all cases of excess of animal heat, the animal, and mankind as an animal, finds relief in evaporation of water secreted in the system, showing that vaporization is the ultimate means of dispersion of heat.

The book is written, as we have said, for the information of Americans, and deals mainly with the climatic conditions of America. But the principles laid down by the author hold good for all the world, and this little tractate may be studied with profit in this country.

#### CHIMNEY-SHAFTS AND LIGHTNING CONDUCTORS.†

This book treats of chimney-shafts, stability of chimneys, descriptions of chimneys, and lightning conductors.

It is a very sensible little treatise, which deserves to be thoroughly studied by all engaged in the erection of chimney-shafts. The chapter on lightning-rods is especially interesting. We quite agree with the author that no chimney-shaft and tall building should be without one.

**SEWAGE TREATMENT.**—At the last meeting of the Aylesbury Local Board of Health it was unanimously resolved—"That the Board are perfectly satisfied with the manner in which the sewage of the district has been treated by the Native Guano Company."

**SCARBOROUGH WATER SUPPLY.**—The result of the poll of the ratepayers on the question of the transfer of the water-works to the Corporation was declared at a meeting of the Town Council on the 14th inst. There were 1929 ratepayers in favour of the acquisition of the local water-works by the Corporation, and 868 against.

\* "On the Relation of Moisture in Air to Health and Comfort." By Robert Briggs, C.E. Philadelphia, 1878.

† "Boiler and Factory Chimneys; their Draught Power and Stability; with a Chapter on Lightning Conductors." By Robert Wilson, A.I.C.E. London: Crosby, Lockwood, and Co., 1877.

#### LIGHTING BY ELECTRICITY.

(Continued from page 86.)

Before closing our remarks upon this important topic, we propose to make a few extracts, from the last and most exhaustive treatise of the day, on the subject. We refer to the work published in Paris during 1877 by M. Hippolyte Fontaine, entitled "*Renseignements Pratiques sur l'Eclairage à l'Electricité*." The author, who is himself the inventor of a lamp, is evidently a man who understands all the contrivances, both old and new, that have at one time and another been brought into use, or been suggested for the production of this kind of light, and cannot be suspected in any way of having a bias in favour of coal gas.

In a chapter devoted to "The Divisibility of the Light," he writes:

Scarcely had a glimpse been obtained of the remarkable effects of the voltaic arc, when thought was directed to the division of the electric light, and before even a good regulator for a single focus was in existence, Mr. King took out a patent for a dividing lamp. However, while the creation of a single focus was steadily progressing, and an artificial sun of 4000 burners had been successfully produced by the aid of a motive power of 10 horses—thanks to the retort pencils praised by Foucault, to the Serrin lamp, the Gramme machines, Sautter and Mangin's reflectors, and Carré and Gaudoin's pencils—the divisibility of the light remained pretty nearly stationary, and did not leave the domain of speculation to enter that of accomplished facts.

If it were necessary for us to judge between Mr. King's process, which dates from 1845, and that of M. Jablochhoff, which dates from but yesterday, we should truly be very much puzzled to say which of the two is the nearer to the real solution, due regard being paid to the exceptional merit of the two inventors.

Must it be said that the divisibility of the electric light is incapable of realization, and that we must despair of ever seeing electricity take the place of gas in its multifarious applications? No; a hundred times no. Science is far from having pronounced her last word upon the transformations of this mysterious fluid, which has already annihilated distance, and may very well, at any given moment, abolish night. We simply assert that from a practical point of view, notwithstanding the excitement recently created in Russia by means of puffing announcements, notwithstanding the remarkable labours of M. Jablochhoff, and the no less remarkable initiative taken by M. Denayrouse, there is nothing in existence at the present day (May 1, 1877) that is simple in application, or that may be recommended for a preliminary trial, and *a fortiori* for definitive application.

Every ten years a new idea springs up; Fame, with her hundred voices, lauds it to the skies; then, after a few unfruitful trials, silence is gradually restored. In 1847 the discovery of incandescent carbons, by Mr. King, in England, began to be announced; in 1857, M. de Changy, in Belgium, substituted platina for the carbon, and added a current regulator; in 1867, M. Le Roux, in France, published a method by which the same current was made to pass alternately and very rapidly into several ordinary regulators; finally, in 1877, M. Jablochhoff, a Russian officer, caused the spark to pass on to a plate of kaolin, and thereby obtained a series of small lights.

We believe that for such great efforts to be crowned with success a new source of electricity would have to be discovered, or some means found of commercially utilizing atmospheric electricity.

In order to avoid onerous trials and such frequent disappointments, it would be sufficient to know the equivalent mechanism of light as we know that of heat.

Each of the systems proposed contains something—a great deal—that is good, and, doubtless, each is capable of rendering important service in special cases. The mistake made by inventors consists principally in desiring to make the use of their apparatus too general, and in talking of immediately suppressing gas lighting. True, electricity has already an immense field of operations, and it presents great advantages in a vast number of applications; but from performing its present functions to acting as a complete substitute for gas there is a great interval, which will very probably never be completely traversed. We have never so much admired the facility of employment, the simplicity of installation, the indefinite divisibility, and the multiplicity of the uses of gas, as since we have been occupied with lighting by electricity.

Thus far we are at one with M. Fontaine, and we can truly say that we never were more thoroughly convinced of the inappropriateness of this subtle fluid for the superseding of gas, and the extinction of darkness, than we are at this moment, notwithstanding its power to annihilate distance. What can equal the simplicity of the means employed for the introduction of gas to the place where it is required for the various uses to which it is now applicable? A pipe is laid from the main of supply to, and into, the house; from the end of this pipe smaller ones ramify, and reach the points where light or heat is required; here the specialities for combustion are fixed, and light, or heat without light, is produced by simply turning a tap and igniting with the flame of a taper. After that it is a matter of simply leaving the accomplishment alone as long as the manifestation of one or the other, or both, is needed. The reversal of the taps which had previously been turned on puts the gas-flame out, and all operations cease without further trouble. If the burners are to be of such a nature as to maintain a uniform flame for any length of time, notwithstanding the variations of pressure in the mains, the appliance for producing this result is really within the dimensions of a Spanish nut shell, and is as lasting as the burner of which it is a part. In all the multifarious applications of coal gas, there is no more skill or attention demanded than a maid-servant can supply, nor do they in any way compromise the safety of the premises in which they are carried out. The "sulphur" bugbear is nearly gone, but the carbonic acid remains, and must continue as long as carbon forms a part of the agent of luminosity; and as carbon is the light-producing constituent in both cases, the two methods of illumination are on a footing, in principle, with regard to the carbonic acid and nitrogen set free.

The heat also evolved by the electric light must be something considerable, unless M. Werdermann made a great mistake when he took out a patent, in 1874, for "An improved method of cutting rock or stone or other hard substances," the secret of his invention being the application of intense heat obtained by means of electricity.

And here we may remark that it is in this patent that we, for the first time, find the carbons placed side by side, as since proposed by



M. Jablochkoff, and the voltaic arc are induced to cross from one point to the other at right angles to the axis of the carbons, instead of in a line with it. Hence our reason for referring to the specification in connection with this subject, that has, otherwise, only to do with the light of the voltaic arc. M. Werdermann says:—

When the rock is very hard, as porphyry, granite, gneiss, and the like, I prefer to use an electric blow-pipe. Figure 12 is a plan of an apparatus for carrying this part of my invention into effect. In this apparatus the carbon points, *g*, of the electric light are fixed on a suitable handle or frame provided with pinions, *h*, and racks, *h'*, to regulate their distance. I blow through the voltaic arc over the two carbon points, *g*, a powerful current of air or steam or other suitable vapour or gas. For this purpose I provide a carbon tube, *k*, arranged over the carbon points, *g*, and provided with an adjusting pinion, *l*, and rack *l'*. The air, steam, or gas is supplied to the carbon tube by a pipe, *m*. When the blast is in operation through this tube, and the light is burning, the flame of the voltaic arc will produce the effect of a powerful blow-pipe; *g*<sup>1</sup>, *g*<sup>1</sup>, are wires connecting the carbon points, *g*, with a battery.

And in a subsequent part of the specification he tells us that "the heat obtained by this apparatus is so intense that the hardest granite is thereby not only calcined, but is fused in a few seconds."

Reverting to M. Fontaine's work, we read in the chapter from which we have already quoted:—

We do not call *divisibility of the electric light* the production of several intense focuses with the same machine or with the same voltaic pile; here it is more a question of small focuses, those of from 1 to 15 Carcel burners, for example. It is undeniable that several lamps may be supplied from the same magneto-electric apparatus; then it is simply a question of ascertaining whether the single apparatus does not cost more in fitting up and setting in operation than a series of small ones, each supplying

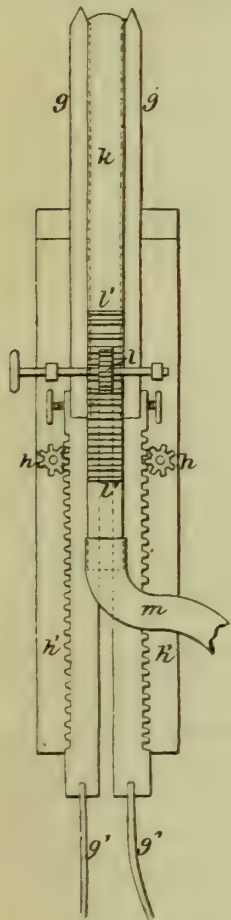


FIG. 12.

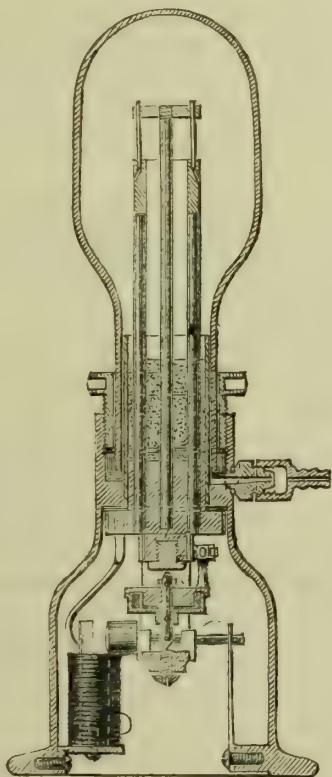


FIG. 13.

one lamp. Up to the present time we have always been in favour of the latter method of installation, but have always encouraged investigations into the merits of the former, and it is not impossible that M. Gramme may yet have the honour of making it thoroughly practicable.

It being quite understood that the divisibility of the electric light is not practically realizable, at least at present, and with the means proposed up to now,\* we pass to the examination of the principal systems contrived for the solution of the problem.

We have already seen, by the result of direct experiments, that the invention of Mr. King, re-invented by M. Lodyguine, and perfected by M. Konn, was more suitable for a single focus than for divisibility; however, the incandescence of the small carbons in vacuum is very advantageous as regards the fixity of the light and the small expenditure it entails. Before rejecting its employment altogether, further experiments should be made with shorter and less bulky carbons of various qualities. It might be possible to succeed in employing this system where only one lamp and great regularity of light were necessary. Some experiments commenced by us in view of the realization of this idea will soon be completed, but it is impossible just yet for us to formulate their results, even approximately.

We remarked above that M. Fontaine is himself the inventor of an electric lamp, which, however, has not yet been practically tried. He gives the following description and drawing of it:—

"This lamp, which is shown in fig. 13, is actually in course of construction by M. Bréguet. It is characterized by the two following points—1. The carbons are fixed by each of their extremities in

\* The fact must not be lost sight of that we are speaking only of the present, without prejudice to the future. We shall scarcely, from time to time, put forward any opinion upon experiments in course of execution, as we do not wish to discourage any one, or give any incorrect information to manufacturers who desire to know our opinion.

rigid contact, and maintained fixed, which permits the lamp to be used in all positions. 2. The electric current passes automatically from one carbon to the other by the action of an electric magnet introduced in the circuit. Even a summary description would not be of great interest, since the lamp is not yet made. Besides, the figure indicates sufficiently the arrangement which we have adopted to realize our aim."

(To be continued.)

## A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLVI.

PUBLIC LIGHTING.

Civilized society is indebted for much of its industrial progress and material prosperity to the lighting of the public streets and roads by coal gas. The change from the old mode of public illumination by means of the flaming torch, and the ancient falot or fire-basin, and even the more modern train-oil lamp, with its uncertain glimmer, to the present system, must be reckoned as one of the triumphs of the nineteenth century.

The courts and narrow entries and alleys that are common to most large cities and towns should be efficiently lighted. The Metropolis is a marvel of admirable arrangement in this respect. Were it otherwise, the opportunities for committing crime, and the incentives thereto, would be indefinitely increased, and there would be little safety in traversing the streets and bye-ways after nightfall. Under existing conditions the avocations of life can be pursued as easily and as safely by night as by day.

No absolutely fixed distance can be named as that at which the public lamps should be placed apart. This may vary from 25 to 70 yards, depending upon the character of the street or locality lighted.

In places where the lighting is used for purposes of decoration and ornamentation, as well as for public convenience, the lamps are frequently placed at nearer intervals than 25 yards. It may be taken, generally, that it is not desirable that the maximum interval should exceed 70 yards.

Lamp-posts, as a rule, should be fixed upon the footpath, at a distance of 12 to 18 inches away from the street gutter. This will be a little beyond the kerbstone, in the flag nearest thereto, and will be out of reach of the wheels of passing vehicles, as they batter towards the footway.

When the trench to receive the base of the column or pillar has been excavated, the soil should be well rammed and levelled, and a flag about 24 inches square and 4 inches thick placed at the bottom as a solid bearing for the lamp-post to stand upon.

Should the column be furnished with a single ladder rest, this may either be cast upon the column, or made of wrought-iron bolted thereto, and may be fixed to project over the footpath. When two arms are provided, these are usually cast upon the column; in this case they are placed so as to project from each side in a line parallel with the street.

Great strength is not required in a lamp-column. If made reasonably strong, it cannot be injured by any traffic on the footpath; and if by accident the wheel of a passing vehicle should come in contact with it, it is usually better that the column should give way and fracture than otherwise.

Lamp-columns are generally made ridiculously tall, as though they were intended to light the clouds instead of the public ways. This is an error that ought to be rectified. By reasonably diminishing the elevation of the lamps, a very important improvement in public lighting would result. Ten feet from the ground line to the burner is a convenient and serviceable height.

Excess of ornamentation in ordinary street lamp-columns should be avoided. At the same time it must be admitted that the pattern of some of those in many large towns is as ugly and undesirable as can well be imagined. An elegant and chaste design is not necessarily more expensive than its opposite; but, on the contrary, will generally be found cheaper, because lighter, and better suited to the purpose intended.

**LIQUEFACTION OF NITROGEN AND HYDROGEN.**—A correspondent of *The Times* writes:—"The *Journal des Débats* announces that on Dec. 31, M. Cailletet, who eight days previously had succeeded in liquefying oxygen, was equally fortunate with both nitrogen and hydrogen, although perhaps it might be said that in the case of the latter gas the performance was not thoroughly complete. The experiments were made in the laboratory of the Ecole Normale, in the presence of MM. Boussingault, Henri Sainte-Claire Deville, Berthelot, Mascart, &c., and these eminent men declared themselves thoroughly satisfied. The nitrogen was reduced to the condition of little drops, while the hydrogen became visible in the form of a vapoury cloud. This was effected in the case of the nitrogen under a pressure of 200 atmospheres, and in the case of the hydrogen under a pressure of 280 atmospheres. In both cases the temperature was reduced to 300° below zero, Centigrade. Thus at last it has been demonstrated that all the gases, without exception, are subject to the common law, and can be reduced to a liquid state. The cold and atmospheric pressure together exercise so great a force of compression on the gaseous molecules, that they are compelled to take the liquid form. Atmospheric air is composed almost exclusively of oxygen and nitrogen; since, therefore, each of these gases has now been separately liquefied, it would seem that their mixture also ought to be open to similar treatment. M. Cailletet accordingly took some air, which he thoroughly dried and purified from carbonic acid, and liquefied it in the same apparatus which had been so successfully employed in the previous liquefactions. When he turned the cock the metamorphosed air trickled out, like some perfumed liquid from an evaporating bottle. It is obvious that it is only a question of carrying these experiments further, in order to reduce those liquid gases to the solid form. The demonstration that it is possible to obtain 'lumps of air' is one of the greatest victories of modern physical chemistry. The 31st of December ought to be a memorable anniversary in the scientific calendar."



## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

## PORTLAND CEMENT CONCRETE.

SIR,—In reply to Mr. G. Livesey's letter, in your issue for Jan. 8, p. 50, I beg to state that I am not an opponent to Portland cement concrete, therefore it is unnecessary for Mr. Livesey to defend its good name on my account. If Mr. Livesey will carefully read the article alluded to, he will find I there stated that I preferred the concrete walls, for gasholder-tanks, with a brick lining; also that concrete, when properly worked, is one-third stronger than brick. I gave also my reasons for saying so, and stated that I in no way advocated the superiority of brick over concrete tanks.

With reference to Mr. Livesey's tank, although he states that the cause of weakness has been discovered, he does not explain in his letter what that cause was. I am aware that he did at one time suggest that, in all probability, the cracks were caused by the difference in the temperature of the water while filling the tank. This I carefully considered, and, after examining the nature and strength of the material, I came to the conclusion that this could not be the cause. I, therefore, attributed the cracks (as stated) to the weakness of the walls.

With regard to the decreased leakage, knowing that concrete does not corrode, and considering the stillness of the water in the tank, little or no sediment would settle in the cracks, therefore the decreased leakage is not due to the cracks taking up, but to the saturation of the adjacent ground.

Mr. Livesey says it is now known that any cracks that may occur in a tank of this description can be stopped; but he does not tell us how. I therefore assume that it is done by stemming the cracks with hemp soaked in linseed oil. Mr. Livesey then states that, had his tank been made water-tight with puddle, as is usual with brick tanks, there would have been no cracks. On this point I agree with him, for it substantiates and accords with the paper to which his remarks refer. He then says that no comparison can be made. Allow me to state that there are tanks of large capacity—viz., 163 feet in diameter, the walls of which are built of concrete with a brick lining, that have been in full work for a considerable time, and which have not cracked or failed in any way, the concrete wall, including the brick lining, being about the same thickness as Mr. Livesey's tank wall. But until a tank made entirely of concrete has been completed and put to work without cracking or failing in any way, I think that I am fully entitled to say that my conclusions are correct, for a cracked tank, although repaired, cannot be considered as sound as one that has not been cracked.

In conclusion, I consider all honour due to Mr. Livesey for putting his ideas (viz., tanks entirely of concrete) into actual practice at his works, and I for one wish him every success in building similar tanks in future.

JOHN CHATTO.

17, Dresser Street, Hunslet Road, Leeds, Jan. 12, 1878.

## CORRECTIONS.

SIR,—I hasten to apologize to the very able author of your "Treatise," in the praise of which, as you are aware, I have always been loud. Indeed, as far as I know, there is no such compact, well-digested, and valuable mass of information on the subject of gas manufacture anywhere to be found.

I do not know how I could be so stupid as to confound, which I seem to have done, the case mentioned with that of the comparison of the rates of effusion of different gases under the same pressure, which rates are inversely as the square roots of the densities.

But my second stricture is just. The "pressure of the gas in the main" does not increase in proceeding from lower to higher points; but actually diminishes, as in all fluids, whether gaseous or liquid. Any applied pressure, as that given by the weight of the holder, is propagated throughout the fluid, increasing the pressure at all points; but not more at a higher than at a lower point. What workmen observe as the "pressure of the gas" is the difference between the pressure of the gas at any point in the main and that of the atmosphere in the open end of the gauge, applied at the same point. And the pressure of the atmosphere diminishing from point to point upwards much more than that of the gas, the excess of pressure of the latter over that of the former increases.

Nothing could be further from my intention than saying anything to disparage the excellent "Treatise," to which I and all who take an interest, whether practical or scientific, in gas manufacture are so much indebted.

Sidney Sussex College, Cambridge, Jan. 17, 1878.

ROBERT PHELPS.

## IRVINE WATER-WORKS.

SIR,—We notice a paragraph in your issue of the 15th of January, that our estimate of these works was £26,500, and that they will eventually cost £38,000 or £40,000. This gives a wrong impression to the public, as our original estimate was £24,000, exclusive of land and way-leave, which we do not pretend to estimate in value; and we find that the works when finished will cost £26,500, and it is the land and way-leave which will bring the cost up to £40,000; but we have not yet learned the result of the land references. Be so good as to correct this in your next.

J. AND A. LESLIE, Engineers to the Works.

72a, George Street, Edinburgh, Jan. 16, 1878.

YAN YEAN WATER-WORKS.—The reproductive character of the Yan Yeau Water-Works is shown by the cash statement and balance-sheet for the year 1876-77, which has been presented to the Victorian Parliament. The revenue received for the year amounted to £84,007, of which £80,580 was from water-rates. The amount disbursed on construction of works from their commencement up to June 30, 1877, was £1,382,565; on maintenance, £56,563; on departmental expenses, £121,869; and on sewerage, £22,314. The amount of revenue received to June 30, last year, was £1,265,629, and the amount repaid to the Victorian Treasury was £956,827.

## Parliamentary Intelligence.

## GAS AND WATER BILLS, 1878.

The following additional memorials, complaining of non-compliance with the Standing Orders, were deposited in the Private Bill Office on or before the 16th inst.:—

Dublin Corporation Water-Works Acts Amendment Bill, from Rathmines and Rathgar Improvement Commissioners.

South London (Spring) Water Bill, from (1) Lambeth Water-Works Company; (2) Kent Water-Works Company.

## HOUSE OF LORDS.

THURSDAY, JAN. 17.

The MARQUIS OF RIPON gave notice that on Monday, Jan. 21, he would call attention to the report of the Select Committee of last session on Conservancy Boards, &c.; and ask the Lord President whether it is the intention of Her Majesty's Government to introduce in the present session a Bill founded upon the recommendations contained in that report.

## HOUSE OF COMMONS.

THURSDAY, JAN. 17.

Mr. EDWARD HOWARD gave notice that on Tuesday, Jan. 29, he will move for a Select Committee to be appointed to inquire into the supply of water to the manufacturing districts of Lancashire and the West of Yorkshire, and any deficiencies likely to arise therein; and whether it is necessary or expedient to resort to the Westmoreland and Cumberland Lakes to make good any deficiencies in such supply; and, if so, to what extent, and under what conditions, such resort should be sanctioned.

FRIDAY, JAN. 18.

PUBLIC HEALTH (IRELAND) BILL.—A Bill to consolidate and amend the Acts relating to Public Health in Ireland was brought in by Sir Michael Hicks-Beach and the Attorney-General for Ireland; and read the first time.

METROPOLIS WATER-WORKS (PURCHASE) BILL.—A Bill to make provision for the purchase by the Metropolitan Board of Works of the undertakings of the several Water Companies supplying water to the Metropolis and to certain places in the neighbourhood thereof, and for the supply of water by the said Board to the Metropolis and to such places, and for other purposes relating thereto, was brought in by Sir James M'Garel-Hogg, Sir Andrew Lusk, Mr. Grantham, and Mr. Rodwell; read the first time, and referred to the Examiners.

PUBLIC HEALTH ACT (1875) AMENDMENT BILL.—A Bill to amend the Public Health Act, 1875, was brought in by Mr. Alexander Brown, Dr. Playfair, Mr. Ryder, and Mr. Joseph Cowen; and read the first time.

## Miscellaneous News.

## METROPOLIS GAS SUPPLY.

LAMBETH VESTRY.—At the meeting on Thursday last, the Lighting Committee reported that application had been made to the South Metropolitan and Phoenix Gas Companies to know what reduction of charges they would make if their lamps were lighted half an hour after sunset, and extinguished half an hour before sunrise. The South Metropolitan Company replied that at the present time they estimate they were supplying the vestry lamps with gas at 2s. 11d. per 1000 feet, and that the cost of lighting by the change would oblige them to raise the charge to the rate of 3s. 2d. per 1000 feet. The Phoenix Company stated that such exceptional arrangement, in practice, would be most complicated and expensive, to light and extinguish the lamps of different parishes at different times, and would more than counterbalance the value of the gas saved. Where similar changes had been made, dissatisfaction had been the result, and the parishes had returned to the plan of lighting and extinguishing at sunset and sunrise.

## METROPOLIS WATER SUPPLY.

THE METROPOLITAN BOARD NEW WORKS BILL.—A largely attended meeting of the Owners and Ratepayers residing within the District of the Uxbridge Board of Health was held at the Public Rooms, Uxbridge, on Thursday night, with reference to the proposal of the Metropolitan Board of Works to obtain a supply of water at Red Hill, Denham, Bucks, and Hayes, Middlesex. The Rev. A. D. Hilton, Chairman of the Local Board, said the members of the Local Board were unanimously of opinion that it was their duty to take immediate steps to protect the town from injury, it being very probable that the Red Hill works would drain the Uxbridge works, and render them and the drainage, which had together cost £95,000, perfectly useless. The following resolution was unanimously passed:—"That this meeting approves of the proposal of the Uxbridge District Local Board of Health to oppose the Bill in Parliament promoted by the Metropolitan Board of Works for the Metropolis water supply, and to charge the expense of such opposition upon the general district rate under the control of the Local Board. At the same time this meeting requests the Uxbridge District Local Board of Health to endeavour to arrive at some amicable arrangement with the Metropolitan Board of Works for the protection of the water supply, and for the interest of the district, before taking active steps to oppose such Bill."

METROPOLITAN ASSOCIATION OF MEDICAL OFFICERS OF HEALTH.—At a Meeting of this Association, on Friday last—Dr. Stevenson presiding—Dr. Tidy, the Medical Officer of Health for Islington, gave a résumé of a paper he is preparing on the Water Supply of London. He compared the supply of London with that of Paris, and contended that the London supply was larger than that in the capital of France; and, with respect to quality, he was opposed to the opinions of those who had stated that the London supply was unwholesome. He contended that turbidity was not a proof of unwholesomeness. Dr. Tripe contended that solid matters in the water were injurious. Dr. Bartlett dwelt upon the extremely bad condition of the water supplied by the Grand Junction Company. The New River water from the springs was good, but when the waters of the Lea were added they were often turbid, and he thought that the Water Companies, when the water supply was below the given standard of purity, should be subject to fine in the same way as Gas Companies were. Dr. Corfield added that it was known that disease germs were often passed into the rivers, and the question to be considered was whether these germs or the poison of disease could be removed. He contended that there was no certainty that the poison from disease, if poured into the rivers, was really removed from the water by filtration. Mr. Angell directed attention to the fact that vast numbers of persons lived on the rivers above the intakes of the Companies, and, in proof of the danger arising from the sewage contamination of the waters, pointed to the report of the Registrar-General, who held that the cholera in the East-end, some years ago, was caused by an accidental contamination of the East London Water-Works Company's water with sewage. Dr. Tidy, in reply, maintained that oxidation in the flowing river provided a remedy for the presence of sewage, and that filtration gave a security for a good supply.



## LONDON WATER SUPPLY.

At the Meeting of the Social Science Association, on Monday, Jan. 14, the subject for consideration was the London Water Supply, a paper being read by Mr. LEWIS ANGELL, C.E., Hon. Fellow of King's College, London.

The chair was occupied by Mr. EDWIN CHADWICK, who, in opening the proceedings, said that the dual scheme of the Metropolitan Board was at variance with the lessons of his 30 years experience at the old General Board of Health. The result of its inquiries was the recommendation that recourse should be had to the sources of river supplies—namely, the springs at their heads rather than the streams themselves, and to soft water rather than hard, as well as to constant distribution and street hydrants. These principles had been applied in provincial towns with undeniable advantages. At the time of the inquiries referred to, a partial examination of the soft spring supplies in Surrey and Middlesex showed that they were double the consumption. These soft spring waters were not more than about one-fifth the degree of hardness of the deep chalk spring supplies; and the works for deep springs were more expensive and uncertain—about one in three being successful. Richmond had been led into a deep spring speculation, while surface springs would have furnished a supply at much less cost. But the engineering mind was prone to prefer visibly big collecting works, and by Clark's process deep spring waters could be reduced to the softness of sand, spring, or of lake waters. Unity of management in London ought to result in a saving of water and expense which would defray the costs of fittings for constant supply, of hydrants, and of new supplies. The deep chalk spring supply was admittedly limited, and it was not necessary to resort to it, because the sufficiency of surface spring supply could be placed beyond doubt. It was more economical to use a small proportion of good water for sanitary purposes, than to incur the expense of a separate system of mains; and for clothes-washing, for boilers, for steam power, and for art purposes, it was desirable that water should be as free from foreign matter as for drinking purposes. The Companies' mains were adequate to the high pressure required for hydrants and fires. The hydrants should be in charge of the police, so that there would be, instead of 400 or even 900 trained firemen, 9000, of whom 4000 would always be on duty, and water might be made available in two minutes instead of fifteen. The risk to life and property would be reduced to a third of what it now was. The Board's estimate of £8 per house for rendering service-pipes sufficient for high pressure was an exaggerated one in the face of the fact that the change was effected in Manchester at 11s. 6d. per house. To sanction the duplicate plan would be to add another blunder to that of throwing the sewage of the Metropolis into the sea without purifying the Thames. In conclusion, he contended that the saving under united management would reduce the quantity really needed so far as to exclude any pretext for restricting the ordinary consumption for domestic or other purposes; that, with inconsiderable alteration, the present mains would suffice to receive the new supply and bear the necessary pressure; and that neither for the domestic supply nor for fire prevention was a duplicate system of works needed.

Mr. ANGELL then read the following paper:—

The somewhat hurried action of the Metropolitan Board of Works in promoting a Bill for a radical change in the arrangements for the Water Supply of London, has brought the subject under the consideration of the Health Committee, who have unexpectedly honoured me with a request to introduce the subject to the Association for discussion, and in the following paper I propose briefly to review the sanitary and financial features of the question.

Water constitutes about three-fourths of the human body, and is essential to the sustenance of all organized beings, for without it neither animal nor plant can exist. But if the water received into our system be impure, the animal functions suffer, the food is not assimilated, the blood is not clarified, and the whole system may be poisoned.

All sources of water supply, whether derived from springs or rivers, are due to rainfall. Taking the average at 32 inches, it is calculated that more than 27 billions of gallons annually fall over the area of England and Wales—a quantity, deducting percolation and evaporation, sufficient for a population 25 times greater than the present, including beasts and machines.

The pure water of the chemist, a combination of two volumes of oxygen and one of hydrogen, is not found in nature; being more solvent than any other known liquid, and having an extensive range of affinities, it is impossible to find it pure. The waters of heaven are fouled before they reach the earth, by contact with floating matter in solid and gaseous forms. The very best water contains a certain proportion of impurity, but within limits such impurities are harmless.

Spring waters, which have filtered through the surface, generally contain mineral or inorganic combinations in greater excess, while organic impurities, especially in nitrogenous forms, representing the result of animal decomposition, abound in river waters, and are the most harmful.

Rivers are the natural drainage channels of the lands within their watershed, and when the catchment basin is either populated or highly cultivated, the rivers must, under the most favourable circumstances, inevitably be polluted by decomposing vegetable and animal products, from manured lands, by the filth of towns, and by the refuse of manufacturing factories.

The essential conditions of a good water supply are—(1) a pure source; (2) constant service; (3) high pressure; and (4) public control.

Neither of these conditions exists in the Metropolis. The supply of so essential a necessary to human life and health is subordinate to considerations of trade. There are eight distinct private and independent Companies which supply London with water. The eight Companies had expended to the end of 1876 more than 11½ millions sterling, and the income for that year was £1,891,861 16s. 2d. The daily average quantity of water supplied to the Metropolis was 118,725,718 gallons, or at the rate of 3½ gallons per head, or 11 gallons per head more than is found necessary for the population and trade of Manchester. In London there is neither public control nor unity of management. Rival mains exist in the same streets. There is a waste of between £100,000 and £200,000 in the multiplication of directorates, of staff, and in loss of water.

Seven out of the eight Companies obtain their water from sewage-polluted sources. In dry weather the New River Company obtain a portion of their supply from wells, but the water flows in an open conduit to London, exposed in its course to contaminating influences. The Kent Company alone supply pure water, from the chalk, to about one-sixteenth of the population. It is within the memory of many, when water was pumped, for domestic purposes, from the Thames, at Hungerford Bridge, within a few hundred yards of the room in which we have met. From time to time improvements have been made by removing intakes of water to positions more remote from town, and now the supply from both the Thames and the Lea is derived above tidal influence; but, above the present points of intake, on both rivers, a very large and rapidly-increasing population inhabit the banks of the main streams and tributaries, and the entire basins are highly cultivated.

Dr. Frankland, in his last annual report, says: "When the heavy rains of December set in, the accumulated filth of the summer and autumn was

swept into the neighbouring streams. The Thames overflowed its banks washing the manure from the cultivated land, and liberating the water from stagnant ponds and ditches. Thus, during the last month of the year the Thames was laden with organic matters of the most objectionable origin, which, carried down to the intakes of the Metropolitan Water Companies, passed through the filters, and were distributed to consumers. Since January, 1873, the Thames has never been in such a filthy plight; and, although most of the Water Companies drawing from this river have greatly improved their subsidence and filtration plant since that date, no care, foresight, or appliance could convert the 'puddle' (to quote an entry in the books of the West Middlesex Company) which entered the Companies' works, into wholesome, potable water fit for dietetic purposes. These uncontrollable and frequently occurring outbreaks render this river a very undesirable source of water for domestic use."

Major Bolton, in his last report, states: "As the sources of the greater part of the water supply to the Metropolis are polluted from time to time by the prevalence of floods, it may be again advisable to draw public attention to the fact, that notwithstanding the greater care exercised by most of the Companies in the storage and filtration of water, the organic pollution contained in the Thames water delivered in London, though subject to fluctuations from the greater or less prevalence of floods, still continues to exist." This shows clearly that the waters of the Thames and Lea are being deteriorated by sewage pollution.

The Rivers Pollution Commissioners in their last report (1874) say of the Thames: "There is no hope of this disgusting state of the river being so far remedied as to prevent the admixture of animal and other offensive matters with the filtered Thames water as delivered in the Metropolis. We, therefore, recommend that the Thames should, as early as possible, be abandoned as a source of water for domestic use."

Of the River Lea, the Commissioners report: "Sewage and other disgusting matters reach the intake of the Metropolitan Water Companies drawing from this river, and the soluble portions of such matter are not wholly eliminated by the efficient filtration to which the water is subjected before delivery. The water of the Lea is slowly, though irregularly, deteriorating from year to year, and there is no hope of purifying it to such an extent as to render it at all times safe for domestic use. We, therefore, recommend that the Lea should also be abandoned as a source of potable water."

During the past year, some of the water supplied to London has been officially reported "turbid," and "full of moving organisms."

The trading Companies who sell this diluted sewage profess to eliminate the contamination by the mechanical process of subsidence and filtration. We are told that the putrefactions of animal matter and infectious excreta are oxidized, and their vitality destroyed, by dilution and motion; that, notwithstanding the amount of admitted pollution, the general results are good and wholesome; and that the effect of the Conservancy and Rivers Pollution Acts will be to intercept sewage and remove the old sources of pollution. But, I submit, it is not sufficient that general results are good if the source be bad. In times of general health, water containing diluted sewage may be harmless in its effects, but when evacuations of typhoid and cholera exist, the diluted sewage is no longer harmless, but actively poisonous. The masterly report of Dr. Farr on the cholera epidemic of 1866 proves conclusively that one of the Water Companies supplied a "dose of cholera matter," which killed nearly 4000 persons; hence the folly and the risk of depending on sources of supply subject to such foul contaminations.

It may be replied that these are things of the past, and such blunders will not recur, especially under the protection of the Rivers Pollution Act. Can we rely on the purification of sewage by towns? They may do so ostensibly, but practically the tank and chemical systems which are being adopted are a delusion; they diminish the polluting powers only to a slight extent; there is but little purification of soluble organic matter. How much pollution escapes at night and odd times, as the result of carelessness or intention! Should a population of four millions be subject to these conditions?

That we should derive our domestic water supply from sources contaminated by the filthiest of pollutions, and urge that such pollutions are effectually removed by oxidation, by subsidence, or by filtration, is a theoretic conceit repugnant to science, to common sense, and to those instincts which are implanted within us by a beneficent Providence for our self-preservation.

I therefore submit that the present river sources of supply to the Metropolis for potable purposes are impure and dangerous, and that a new source is necessary.

Even if the present sources were pure, the existing arrangements would deprive us of the advantage. Pure water should be delivered pure, without stagnation and deterioration from contaminating sources.

It has been aptly put that the result of the present intermittent system is to make "a good supply bad, and a bad supply worse." The present system of distribution and storage is of the worst possible kind. The water is first stored at the works, and then transferred to the London cisterns.

The butts and cisterns of London, especially in the poorer neighbourhoods and smaller houses, and their name is legion, are situated in close courts, and contiguous to every kind of filth; generally placed over the water-closet, near a sink and dust-bin, untrapped pipes communicating directly from the cistern to the soil drains. They are frequently uncovered, consequently the water absorbs the impurities of the surrounding atmosphere; they are not cleaned out from one year's end to another, so they accumulate mud and slimy vegetation. In short, the water, however good originally, becomes offensive and unwholesome. Is it to be wondered that the London beverage is not water?

Nor is this condition of things limited only to the houses of the poor. In the civic palace of this, the wealthiest city of the world, three-quarters of an inch of floating fungi scrub was recently found on the surface, and three-eighths of an inch of mud at the bottom, in the cisterns which supply my Lord Mayor, while a bottle of water on his lordship's table contained hundreds of nematoid worms. Nor is the West-end better than the City, for in the cistern of the Athenæum Club, St. James's, was found a large quantity of offensive mud and animal organisms.

It is unnecessary to multiply instances, or enlarge on the evils of the intermittent supply. It results in the waste of nearly half the water supplied, and the contamination of the remainder. The facts are incontrovertible, and beyond the range of discussion.

The maintenance of a constant supply in the street-mains, a constant service to every house, and the discontinuance of storage cisterns for drinking and culinary purposes, are, therefore, essential conditions of a good water supply.

In the present condition of things in London the necessary change from an intermittent to a constant system involves formidable financial consideration. Constant service will require new fittings to resist the pressure. There is, as might be expected, great opposition from owners of house property, especially of the smaller class, whose incomes depend largely on this source, to the cost of substituting proper water-fittings for the constant system—an opposition which is supported by the formal resolutions of Vestries and District Boards in the interests of property



owners, and there is something to be said on their behalf. Is it equitable that the cost of the necessary change of fittings, to secure so necessary a sanitary advantage as a constant supply, should be wholly imposed on landlords? Under the Public Health Act, the cost of private improvements may be extended over 30 years, or, what is more analogous, under section 24 of the same Act, where, for public reasons, it is found necessary to alter private drains, the cost of such private alteration is thrown on the public rates. The cost of adapting the house fittings to a constant service would be oppressive if levied at once on the owners of small property; the purity of water is a public question, and the cost ought in the first instance to be arranged on some equitable basis between the public and the owners. Some of the Companies are competent to give a constant supply, but it is only adopted in a small proportion of houses on account of the difficulty of fittings. The annual saving in water alone by better fittings would go far to defray the cost of the change.

The existing pressure of the London Companies is admittedly sufficient for domestic requirements, but utterly inadequate for a general fire service. Under the present mechanical arrangements, if the mains be charged, which is not always the case, water is delivered at the road level, the pressure of the Water Companies is practically useless by a jet under the conditions of friction through hose; it is, therefore, necessary to wait for the arrival of fire-engines to project such a jet, and much water runs to waste from street plugs. The real value of water is obviously at the first outbreak, when a few gallons will prevent a conflagration. Fire-engines prevent the extension of fire, but generally arrive too late to save the premises first attacked.

The fire establishment of London, efficient as it is, is ridiculously small as compared with other great cities. London boasts to be the largest, wealthiest, and most populous city in the world; but its fire establishment costs in relation to population only one-half that of Paris, and one-tenth that of New York. £80,000 is spent annually in the protection of property worth at least £1,000,000,000, only one-half of which is insured. The weakness of the system in London is, however, not want of water, nor of men, nor of skill, but in the cumbersome arrangements. Captain Shaw reports the total quantity of water used at 1632 fires in 1876 was only 21 million gallons, although double the amount of the previous year. Of this quantity less than  $\frac{1}{2}$  million gallons were taken from the fire-plugs; therefore, out of nearly 120 million gallons daily supplied to London, only the small quantity of 23,000 gallons was required for fires. Small as the quantity was, it would have been very much less could it have been quickly applied from the nearest hydrant by the nearest policeman, and many a "serious" fire would have been avoided.

It is in the fire department that the necessity for unity of management and public control of the water service is most apparent. On the outbreak of a fire, messengers have to be sent more than half a mile in one direction for the firemen, and half a mile in another for the waterman, but the policeman, who, perhaps, discovered, or had first notice of the fire, is comparatively useless; whereas, if the police had ready access to a length or two of hose to attach to the nearest hydrant, charged at high pressure, the fire would have been extinguished without either fireman or turncock, whereas, under the present system, the Fire Brigade arrive too late to prevent a conflagration. In Manchester, by the hydrant and police system under unity of management, 97 per cent. of the fires are confined to the rooms in which they occur.

Under present arrangements it is within the range of possibility that the Metropolis may, through an unfortunate combination of events, suffer from fire as other great towns have done. The late Mr. Braidwood contemplated a second Fire of London if once a fire obtained mastery in one of the large stacks of new warehouses during a high wind. Since Mr. Braidwood's time, there has been but little improvement in the water service, and Captain Shaw declares the Fire Brigade to be over-strained, and that his force of 398 men should be increased to 930.

In 1876 I had occasion to report on the fire arrangements of a thickly populated manufacturing district, outside the area of the Metropolitan Board of Works. I then said: "The fire arrangements should be in the hands of the police, who patrol in all directions, and are generally first to call the engines. A disciplined force, with a reserve on duty night and day, and ready to act instead of calling others, would undoubtedly form the most efficient brigade." The Select Committee of the House of Commons on the Metropolitan Fire Brigade have since made a similar recommendation.

Undoubtedly a special fire organization must also be maintained, as at Manchester and other large cities; but it should be a department of police; and every one of the 10,000 police who in turn patrol every street, day and night, should also be a fireman on his beat, and, when he discovers a fire, his first act should be to do his best to put it out, until reinforced from the nearest fire police station. With a fire brigade so organized, and the water arrangements under public control, and capable of giving due pressure, the Metropolis might look for comparative immunity from destructive fires.

The plausible objection to placing the fire service of London under the police is that it would be beyond the representative control of the rate-payers, who provide the funds. But, for imperial reasons, the police of London are already extra-municipal, and if, as is evident everywhere, the fire service is more efficiently conducted by the police, it follows that, in the public interest, the fire service of London should also be exceptional. Imperial interests, imperial treasures, and a population of four millions are exceptional features.

But to recur to the main question:—What is the best practicable remedy for the radical defects in the purity, pressure, and control of the London water system?

It is the modern experience of most large cities that the rapid increase of population, a better appreciation of sanitary principles, and the greater range of social requirements outgrow the old machinery and organization. The water question is one of these. This new necessity presents difficulties, of financial magnitude, which at first sight appear insurmountable. The complex interests and divided authorities of this overgrown Metropolis oppose obstacles to municipal reform such as do not exist elsewhere; hence the smaller dimensions and more compact government of provincial cities render changes more practicable; consequently, Manchester, Liverpool, Glasgow, and smaller municipalities have reformed many things which remain a blot on the Metropolis. But, if we are to escape fire and pestilence, the time has arrived when London must abandon polluted sources for its drinking water, and adopt a service of constant high pressure. How is this to be accomplished? The case is especially difficult. Already a complete system of water-works exists, upon which nearly 12 millions have been expended. The enormous quantity of 120 million gallons supplied daily cannot be obtained from pure sources. Lakes and catchment basins are available for the great towns of the north, but London is too remote from any suitable gathering-ground. On the other hand, the present supply is ample in quantity, and generally suitable for all save drinking and culinary purposes. Allowing 2 gallons of pure water per head, 8 million gallons would suffice for the daily supply of the present population for dietic purposes, or only one-sixteenth part of the present total supply, while the remaining 112 million gallons need no such high standard of purity. It is practicable to obtain the smaller quantity from absolutely pure sources; but it is

unnecessary and financially impracticable to obtain the larger quantity with the same degree of purity. This proposition, of course, suggests a dual supply, as now proposed by the Metropolitan Board of Works, and as suggested in my Presidential Address before the Association of Municipal Engineers, at Birmingham, in 1874, where I said: "There was great waste in the purification of water not required for domestic purposes. Out of the 30 or 40 gallons of water per head supplied to the population, less than one-fourth is used for domestic or drinking purposes, the remainder being used for street-watering, sewer-flushing, and other processes which do not demand any degree of purity. The necessity for purification of water is confined to the 5 or 6 gallons per head required absolutely for domestic purposes. Such a distinction of supply would, of course, involve a dual system in every house. The reduction of the purified domestic supply within reasonable limits would greatly assist in the settlement of the sewage question by reducing the demands upon water companies, and bringing the standard of sewage purification within easily obtainable limits."

The scheme now propounded by the Metropolitan Board is, in my opinion, the best practicable way of meeting the enormous difficulties of the position; viz.—1. By placing the control of the combined works of water supply on a public footing. 2. By the introduction of a special pure and constant service at high pressure.

The advantages of unity of staff and management under public control, as compared with divided management, waste of water, inefficiency of public and private service, and a wasteful expenditure of between £100,000 and £200,000 per annum, needs no discussion. The necessity has been long acknowledged, and repeatedly officially recommended, since the time of the first General Board of Health in 1850.

With regard to the new sources of supply, it has been repeatedly shown that the basin of the Thames contains ample springs of most excellent quality. The Royal Commission of 1874 reported that, within fifty miles of the Metropolis, at least five times the present volume of water supplied could be obtained from springs.

The analyses of the waters at present supplied to London show that water from the chalk springs of the Kent Water Company is invariably distinguished from all other supplies by being lower in temperature, purer in quality, unaffected by animal or vegetable life, and needs no filtration; it is cool, sparkling, and palatable, and there is no evidence that chalk water is less healthy than soft water. By comparing the mortality of hard and soft water towns, it will be found that the one neither improves, nor the other lowers, the general health. London, with its hard water, has a relatively low rate of mortality. A large portion of the earth's surface consists of calcareous districts, and whole populations live upon chalk waters. The manufactures of the Metropolis are not such as to create a great demand for soft water, and the soap-saving question is much exaggerated. Soft water having disadvantages as well as advantages, there is not sufficient justification for discarding home supplies for new sources, at a great distance and at a large cost. The Royal Commission of 1874 report of the Kent water, "That the continued and extended supply of this and similar water to the Metropolis is very desirable."

The application of the foregoing argument supports the principles of the scheme propounded by the advisers of the Metropolitan Board, which scheme is thus stated: It is proposed to supply, by separate mains constantly charged, pure spring water, under high pressure, for potable purposes, to every house; to use the same mains, water, and pressure for the service of the hydrant jets, to extinguish fire; to provide on the high ground, to the north and south of London, four covered service reservoirs, holding enough for four days consumption.

For the purpose of supplying these, it is proposed to sink, in the great water-bearing strata in the country districts around London, wells and borings at distances varying from about 15 to 20 miles from the centre of the Metropolis, and by proper pumping-stations to lift the water from them into the four reservoirs. It is estimated for two sources of supply, and for two pumping-stations for each reservoir, making a total of eight pumping-stations, from which to derive the 16 millions of gallons per day.

These reservoirs would be 400 feet above Ordnance, and from each reservoir would proceed sets of arterial mains which would traverse the Metropolis, and be coupled so as to put all the reservoirs into communication.

From these arterial mains supply-mains would proceed along the streets, under the footway, at each side of the road.

It is proposed to fix, in each house, an air-tight pressure receiver, holding, according to the size of the house, from 2 to 10 gallons. This receiver would be placed in the basement, and close to the point of inlet of the service-pipe. It would have only one draw-off tap, from which the water would be taken, and when the receiver was emptied it would be so arranged as to fill up again gradually.

Such a scheme naturally involves the purchase of existing water-works; indeed, under any circumstances, this must be regarded as a primary condition, and if there be a dual system it must be under one control.

Several schemes have been proposed from sources which have since become largely contaminated. In 1850, the General Board of Health recommended that the present river sources should be abandoned, and a surface supply obtained from gathering-grounds on the Surrey sands, between Bagshot, Woking, and Farnham, which were estimated to yield 28 millions of gallons of soft water daily, but would require filtration to remove the infusion of peat; the remainder of the supply was to be obtained from the harder waters of the River Wey and its tributaries. The General Board only contemplated a total supply of 40 million gallons daily, whereas, at the present time, London consumes three times that quantity, and has quite outgrown the Surrey scheme. Catchment schemes have failed in dry seasons, while the great stores of subterranean waters have supplied the London rivers during the severest droughts.

Other schemes have been propounded, notably that of Mr. Bateman, in 1865, for bringing water to London from the sources of the Severn, at a cost of about £8,685,000 for the supply of 130 million gallons daily, or an ultimate supply of 230 million gallons, at a cost of £11,400,000. Messrs. Hemans and Hassard, about the same time, propounded a scheme for bringing 250 million gallons daily from the Lakes of Cumberland and Westmoreland, at a cost of £13,500,000. With present prices, both these estimates would have to be very largely increased, and it would be equally necessary to purchase the interest of existing works. Both schemes were gravitating, but neither would give a constant high-pressure fire service without the addition of pumping. The Royal Commission of 1869 report: "It is satisfactory to know that there exists, within easy reach of London, a supply of the best and purest spring water, which, in case of need, could readily be rendered available as an auxiliary source of water supply to the Metropolis, in quantities sufficient, at all events, for drinking, if not for other purposes."

The estimated cost of the scheme of the Metropolitan Board, including street hydrants and house-fittings, is  $\frac{1}{2}$  millions, representing an annual charge on the metropolitan rates of a quarter of a million, or 2½d. in the pound. It is contended that, by the expenditure of this large sum, an "absolute saving" of £137,000 per annum will be effected, as compared with the cost of adapting the existing water-works, by increased pumping,



to give constant high pressure, alteration of house-fittings, fixing hydrants, and the cost of the contemplated extension of the Fire Brigade, which will be rendered unnecessary.

The cost of acquiring the existing works is estimated at £25,000,000, representing an annual charge of £875,000, or 8½d. in the pound; adding the cost of the new scheme, £250,000 per annum, the dual scheme will, therefore, involve a charge on the rates of about £1,100,000, or 11d. in the pound. Against this is to be set off the revenue from such water-rates as the new governing body may impose. The total revenue of the eight existing Water Companies during the year ending December 31, 1876, was £1,292,569 14s. 2d., exclusive of more than half a million of balances brought forward. Therefore, on sanitary, financial, and practical grounds, a dual system, established on a public basis, recommends itself for adoption under the special circumstances operating in the Metropolis.

Whether either a new source of water or new works be adopted, the time has arrived when the existing works should be taken out of private management, and placed on a public footing. So important a matter ought not to be subordinated to mere private interests and trade purposes.

But the body which propounds the new scheme is not the governing body of the Metropolis. There is a "Greater London," which also requires pure water and protection from fire. The functions of the Metropolitan Board are not even conterminous with the area of the various Water Companies which it proposes to acquire.

London cannot afford to repeat the errors of the past by accepting any partial scheme which confines general advantages within artificial limits. The use of water is steadily increasing, and the question must be extended beyond the limits of the Metropolitan Board. So great a scheme must be identified with extended powers which shall embrace "London over the border." The great question of the consolidation of Municipal Government is beyond the province of this paper. It will be for the wisdom of Parliament to determine how the greatest good shall be enjoyed by the greatest number, but it cannot be tolerated that the "outer ring" shall be excluded from any vital scheme affecting them equally with the more limited area at present known as the Metropolis.

Whether the Metropolitan Board shall be extended or give place to a Municipality of London, or whether the water supply be confided to a special Commission, one condition is essential—viz., that the entire population which forms the aggregate of "London" shall participate in the advantages.

I therefore submit the following conclusions:—

1. That the river sources of the London water supply are hopelessly impure, and should be forthwith abandoned for dietetic purposes.
2. That the magnitude of London and financial considerations point to a limited supply of perfectly pure water for dietetic purposes, supplemented by the present sources for general purposes, as the most practicable method of dealing with the question.
3. That the new supply should be constant and at high pressure.
4. That the entire system should be under public control, and extended to the whole population of London.

In the discussion that followed,

Mr. FOWLER (member of the Metropolitan Board of Works) asked if, supposing the new source suggested by the Chairman contemplated doing away with the present supply and the present works of the various Water Companies in the Metropolis.

The CHAIRMAN, in reply, said he thought, with some exceptions, the present works might be made available. Of course, in some instances, larger mains would have to be put down for fire protection.

Mr. FOWLER said no doubt the distribution would be easy enough, but the point was, how would the water be brought from the Bagshot Sands to the various works?

The CHAIRMAN said one plan was to bring the water to Wimbledon for distribution from that point.

In answer to Mr. EASTMAN, the CHAIRMAN said the spring sources from whence the water would be derived would prevent any sewage pollution.

Mr. B. ATTENBOROUGH, representing a local authority, said he would like to know whether the Ratepayers of the Metropolis would be compelled to buy up all the Water Companies at the enormous cost of £25,000,000, seeing that they could have purchased them up in 1851 for £6,000,000. He should think London could be supplied from Bagshot Sands for an outlay at the most of 12 or 15 millions. The Companies, by not carrying out the very conditions they 20 years ago obtained powers for, had lugged the ratepayers into a charge of 400 per cent. on their capital, if the scheme of the Metropolitan Board of Works were to be adopted. He believed every requisite in a pure and continuous supply could be conferred by the present Companies under the powers and conditions then existing.

Mr. JONES said he hoped the condition of the Ratepayers of London, which was now reduced to one of poverty, would be properly protected in any scheme which might be carried out. The Companies had not acted fairly in dealing with those from whom they demanded rates. His own water-rate was 30s. some years ago, but now it had gone up to £5 8s., and he supposed some profit was made when it was at the lower sum. The Metropolitan Board of Works, it seemed to him, permitted themselves to be twiddled round the fingers of their engineers, whilst they were sent as representatives for purposes of judicious legislation. He did not think it would be found there was a sufficient quantity of water to be got either from sand or chalk to supply the Metropolis; at all events, not water free from iron.

Mr. BALDWIN LATHAM, C.E., said no man in his senses would recommend the ratepayers to go in for the scheme proposed by the Metropolitan Board of Works. If the Kent Company's water was so much superior to that of the Thames, the results, especially in a zymotic sense, in the districts supplied by the former should be much more favourable in comparison with those fed by the latter; but it was not so, and in support of that view he read statistics. He did not agree with the plan of collecting the water from Bagshot Sands, and distributing it in the metropolitan area, because it was well known by engineers who, like himself, had made experiments upon the subject, that whenever the waters in the springs were low it was a fever year, and when they were high it was a healthy year throughout the country.

Dr. TUDY said there could be no question that, in the districts served by the Kent Company's mains, zymotic diseases were more prevalent than in those supplied by water from the Thames. The results which had been paraded in the sixth report of the Rivers Pollution Commission about sewage contamination were not, he contended, those of chemical analyses, but of investigations of a different character altogether. When they were having a water supply more pure and uncontaminated than ever, were they to adopt new schemes which, in his opinion, were unnecessary? He had no interest in the Water Companies himself, but he did not recognize the necessity for the immense expense to which the Metropolitan Board of Works proposed to go.

Mr. ANGELL, in replying, said the water which the people of the Metropolis drank should be pure, and should be procured from pure sources, and that was the great principle to be studied, whatever their individual views—differing as they did in many important points—happened to be. The purest water would give the best health, and the whole matter was one which would have to be fought out before the public, with the best evidence

which could possibly be obtained; and he did not think Government would allow the various Water Companies to be suppressed, if they were to be suppressed, without their fair and proper value being paid.

Votes of thanks to the Chairman, and to Mr. Angell for his paper, closed the proceedings.

#### EUROPEAN GAS COMPANY, LIMITED.

An Extraordinary Half-Yearly General Meeting of this Company was held at the London Offices, Austin Friars, on Wednesday, the 16th inst. —W. WHITE, Esq., in the chair.

The SECRETARY (Mr. Henry Dozell) read the notice convening the meeting, also the following report by the Directors:—

The political state of France during the past six months has adversely affected the interests of the Company, preventing, in some cases, the usual increase in the consumption of gas, but notwithstanding this unfavourable state of affairs, the business of the Company has been well maintained in the aggregate, and has even exceeded that of the previous year at several stations.

At Rouen many of the cotton manufactories have been working full time, and that branch of industry appears to be specially prosperous, whence a considerable increase of consumption of gas has taken place at that station.

At Boulogne many new gas consumers are now supplied, not only for lighting, but for cooking and heating. It may be remarked that the use of gas for such purposes is now being more rapidly developed at other stations of the Company also, than at any previous time. Much, however, yet remains to be done, and a large field may be found for future extensions. Every encouragement is offered by the Board to bring this into operation as quickly as possible.

At Caen the variations in trade are generally less severely felt than at other stations, and the past year has not proved an exception to the rule; but at Havre business has been remarkably dull, and such economy has been practised by the inhabitants that during several months the quantity of gas sold did not attain the same amount as in the corresponding period of the previous year.

At Nantes, Amiens, and Bolbec, nothing requiring special notice has occurred, but in some cases the Board have considered it prudent to meet the difficult circumstances of the time by reducing the price of gas and making extra allowances, within such limits, however, as not materially to affect the Company's revenue.

The Directors regret to state that the value of coke has seriously diminished, owing to the continued mild weather which still prevails. Large stocks have been accumulated, notwithstanding repeated reductions of price, and the loss and deterioration from stacking considerable quantities are matters of importance.

Should the temperature, however, be more seasonable, during the remainder of the winter, it is possible that this unfavourable state of affairs may assume a more satisfactory aspect.

The Board of Directors have the pleasure to state that, since the last change of Ministry in France the general trade of the country has become more active, and should this revival prove permanent, of which the prospect appears promising, the results of the current year, when the accounts are made up to the 31st of March, may yet show an amount of net earnings equal to that recorded for the financial year 1876-7, when a considerable balance remained after paying the usual dividend.

Debentures to the amount of £18,100 came to maturity on the 1st inst., £5900 of which were bearing 5½ per cent. interest; £11,400, 5 per cent.; and £800, 4½ per cent. These have all been renewed or replaced at 4½ per cent.

The usual interim dividend for the half year, at the rate of 8 per cent. per annum, will be paid on the 1st of February by means of warrants to be forwarded to the shareholders on the previous day.

The CHAIRMAN: Gentlemen, I think I need hardly remind you that we, as a Company lighting towns in France, have been passing through rather difficult times lately, and I think those difficult times have been quite sufficient to account for the fact that the report just read is not quite so bright as others which have preceded it. From May to December last the fate of France appeared to be, as it were, hanging in the balance. Commerce was paralyzed, and the effect of this continued state of things was distinctly felt at our various stations. Happily a favourable change has occurred, and the present Government seems to inspire greater confidence in its permanency than that which has passed away. With reference to coke, we thought it necessary to deal at some length in the report with this residual, because, as we have stated, we have been obliged to make continual reductions in the price, in order to keep our stocks down as much as possible. If Providence would only allow us to have three or four weeks of cold weather, we should be placed in a very different position, and if such weather would come at once it would suit us very much better. You will observe that we refer also in the report to several reductions that have been made in the price of gas. Those reductions have been conceded to enable us to retain customers who otherwise would have escaped us. I do not think it desirable to go into this question at greater length, as it involves some considerations of great delicacy; but those deductions will be perceptible in our returns at the end of the year, as they may not be covered by the increased consumption which they were intended to produce, so we think it desirable just to call your attention to them. With regard to tar and ammoniacal liquor, we have been doing moderately well, and have no reason to complain. With reference to coals, we have nothing to add to that which we have previously reported to you. The favourable contracts we made some time ago, both for coals and freight, have been duly carried out, and we have good reason to be satisfied with them. While the trade of all countries has remained in so depressed a state, we can hardly expect that that of France should be restored to its former activity, and though it is still better than that of many nations, it does not yet seem sufficient to render any large increase in the use of our commodity—that is, gas—probable. Such being the case, the outlay for extensions will be limited, and for the present we do not see our way to engage in any additional works other than those of which you have already been made aware. At several of our stations we have availed ourselves of this quiet interval to overhaul the mains and bring them into a state of full efficiency. The cost of such undertakings is, however, borne by revenue, except in cases where larger mains are laid to supply increased business. You will see by the report that we have reduced the charge for interest on debentures, by replacing at 4½ per cent. those at a higher rate, which came due on the 1st of this month. I think this is another proof, if one were wanted, of the very high estimation in which the securities of this Company are held by the public. I have already stated as much as I consider it prudent to say respecting future prospects, which depend upon the revival of trade and the state of the weather. I can only say in addition that we clearly see our way to hold our own, and to be ready to provide for the improved state of business, which we believe must come sooner or later. Having now touched upon those various points, which, no doubt, are of most interest to you, I will move—"That the report just read be received and adopted;" and, this having been seconded, I shall be ready to hear any remarks which may be made on it, and to answer any questions which may be addressed to me on the affairs of the Company.

Mr. CHALONER SMITH seconded the motion, and no one rising to address the meeting, it was at once put and carried.

On the motion of Mr. STOKES, a cordial vote of thanks was given to the Chairman and to the Directors for their continued attention to the interests of the Company.

The CHAIRMAN acknowledged the compliment. He said: On behalf of myself and brother Directors, I have to thank the Shareholders for the vote they have just passed. Though it is so often repeated, something like twice a year, still it is an encouragement to your Directors to go on doing the best they can for the Company. We like to live in the confidence of our Shareholders, and it is my privilege, and that of my brother Directors, to think we do so.

The proceedings then terminated.



## PARA GAS COMPANY, LIMITED.

The Ordinary General Meeting of Shareholders was held at the London Offices of the Company, Union Court, Old Broad Street, on Thursday, the 17th inst.—JAMES BRICKWELL, Esq., in the chair.

The SECRETARY (Mr. T. S. Borradaile) read the notice of meeting, and the following report and statements of account were presented:—

The Directors have the pleasure of submitting to the Proprietors the Statement of Accounts and Balance-Sheet of the Company for the half year ending the 30th of September last. The result, as shown by the Revenue Account, is a profit for the six months of £3531 6s. 4d., after providing for all bad and doubtful debts.

The falling off in the revenue obtainable from private lighting is the point most to be noticed in this result, and the Engineer and Manager (Mr. Louis Penny) states that this is due principally to the reduction in price lately made in petroleum, which can now be purchased at 1s. 6d. per gallon, a cost that induces some, and compels the poorer class of consumers, to use this cheap illuminating agent instead of gas. This loss, however, is somewhat neutralized by the improvement in the revenue from public establishments, which improvement arises from the Barracks and other Government buildings having been fitted for, and using gas.

A large theatre in the town of Belem is now in the course of completion, and it is expected that this will prove a fresh source of revenue to the Company. The necessary sun burner, chandeliers, &c., &c., have just been despatched from Liverpool for this building.

The general trade, and consequently the financial position of the town, has in no way improved during the last twelve months, and until some revival takes place it must be expected that strict economy will be the order of the day, and the use of gas deemed almost a luxury.

The low cost of coals and freight has been again in favour of the Company, of which the Directors have taken every advantage. The Newcastle gas coal lately shipped by the Company having been favourably reported upon by the Manager, the Directors have secured their supplies in advance for the current year on what are deemed to be very satisfactory terms.

An interim dividend was paid by the Directors (in accordance with the powers vested in them) in June last, at the rate of 3 per cent. per annum, and they now recommend the declaration of a dividend at the rate of 5 per cent. per annum for the half year just closed, thus making a total dividend of 4 per cent. per annum for the twelve months ending on the 30th of September last, and carrying forward a balance of £1106 4s. 6d.

The letters and reports from the Manager are quite satisfactory, and the works continue to be maintained in a thoroughly efficient condition.

Two of your Directors—namely, Mr. Thomas Clarke Tatham and Mr. James Brickwell—retire by rotation, but are eligible for re-election, and offer themselves accordingly.

Mr. Philip Crellin, the Auditor of the Company, likewise retires from office, but, being eligible, also offers himself for re-election.

Dr. General Balance-Sheet, for the Half Year ending Sept. 30, 1877. Cr.			
Authorized capital	£175,000 0 0	Works, including extensions, furniture, &c.	£112,824 0 2
Less not taken up	8,130 0 0	Gas-fitting capital on March 31, 1877	11,122 13 8
	£166,870 0 0	Extensions to date	69 18 6
Debtenture loan	5,000 0 0	Value of stock in Pará	3,559 1 7
Fire insurance-fund	834 11 11	Lighter capital	1,732 14 11
Bills payable	772 5 11	Stores	2,037 1 7
Sundry creditors in London	320 8 11	Coals	4,137 12 5
Ditto in Pará	343 14 6	Sundry debtors in Pará	8,790 15 5
Gas-fitting rental reserve-fund to March 31, 1877	£493 14 5	Maui and Co. (in suspense)	112 14 9
Add reserve for the current half year, less expended in repairs	110 16 8	Cash at Pará bankers	1,654 7 0
	604 11 1	Ditto Glyn and Co.	440 8 10
Profit and loss account	5,277 19 5	Petty cash (London)	7 7 11
	£180,023 11 9	Bills of exchange, in hand	3,535 0 0
			£180,023 11 9

Revenue Account.			
Coals & wood for carbonizing	£3,185 4 0	Public lamps, &c.	£5,789 3 5
Wages, including lamp-lighting	2,038 6 1	Private lights	3,110 17 9
Salaries	821 6 10	Public establishments	355 1 11
Sundry charges	61 0 2	Illuminations	39 4 7
Retorts	46 4 6	Fittings-rental	115 3 7
Repairs	308 15 9	Meter-rental	197 13 10
Office expenses, stationery, &c.	117 11 2	Lighter revenue	213 10 6
Law charges	89 10 5	Coke	1,151 0 7
Gas-fitting revenue and expenditure	669 13 6	Tar	100 11 9
Interest and discount	22 19 10	Rent and taxes	134 10 4
Debtenture interest	150 0 0	Exchange	223 16 4
Directors fees	300 0 0	Transfer fees, &c.	1 17 6
Travelling expenses	90 13 6		
Profit and loss	3,531 6 4		
	£11,432 12 1		£11,432 12 1

Profit and Loss Account.			
Interim dividend declared	£2,503 1 0	Balance brought forward from March 31, 1877	£4,335 2 4
Bad debts to this date	£103 6 2	Revenue account (profit)	3,531 6 4
Less recovered during the half year	17 17 11		
	85 8 3		
Balance carried forward	5,277 19 5		
	£7,866 8 8		£7,866 8 8

The CHAIRMAN, in moving the adoption of the report, said although the Directors were able to show a certain amount of improvement in their accounts, they regretted to note that the improvement had not arisen from a better condition of trade in Pará. In truth, if any change at all had taken place in that respect, it was rather in a backward direction than otherwise, and probably it was hardly possible for business there to be worse than it was at the present moment. This fact must also be taken in connection with the circumstance that the Company had a strong antagonist in the consumption of petroleum for lighting purposes, which could now be purchased at so low a price that its general use was readily accounted for. The success of the Company resulting from last year's operations, and, particularly during the last six months, was mainly attributable to the advantage derived from the low price of coal. He believed the price had not exceeded something like 7s. 3d. per ton f.o.b. at Newcastle for first-class coals. Freight also had been extremely favourable, not exceeding 15s. or 16s. per ton. The Directors had been so well satisfied with the character of the coal sent out (in which satisfaction their Manager in Pará shared), that they had entered into arrangements, at a somewhat less price, for another year's supply, although their present stock at the works would probably not all be carbonized before the month of August next. They had not been able to secure freights on equally eligible terms; but they had instructed the Secretary, who was well versed in shipping matters, to take advantage of the most reasonable offers he could obtain. While the cost of coal had been favourable, the value of coke had unfortunately been depreciated; but the Manager had entered into arrangements with the small steamers which plied to Pará, and so had got rid of considerable quantities at fair prices, which had enabled him to keep up the ordinary price in the town. Although, therefore, the item of coke in the accounts was not quite so good as on the last occasion, the deficit was not very great.

The SECRETARY said the reduction upon last year was about £90.

The CHAIRMAN said it was satisfactory to know that the financial position of the Company in Pará had much improved. Their relations with the Government were considerably better, and the public accounts were now settled up much closer than they had ever previously been. In past times the Company had suffered frightfully from the infliction of fines, in consequence of regulations which might almost be said to have been unjustly adopted at Pará. The Manager had shown such good diplomacy in this matter that he was now enabled almost entirely to avoid these continuous fines, which were often inflicted without reason, and which amounted to considerable sums of money. Looking at all the circumstances of the Company, he (the Chairman) thought he could safely say that all they needed was a revival of trade. If that could be secured their affairs would become more prosperous. It was a satisfaction to the Directors that the profit and loss account now presented was somewhat better than the last; and that, taking the whole year, they were enabled to pay the Shareholders dividends at the rate of 4 per cent.

Captain CLARKE seconded the motion.

Mr. H. P. STEPHENSON called attention to the gas-fittings capital, which he said amounted to nearly £15,000, while the annual expenditure on gas-fittings, according to the profit and loss account, was nearly £1300. He wished to know whether it was likely that this large expenditure would be maintained. He was quite aware that the present Directors inherited the legacy of gas-fittings in the capital account, from their predecessors at the Board, and what he wished to suggest was that they should take into consideration the question of the desirability of increasing the charge for gas-fittings rental, which appeared to be so inadequate.

The CHAIRMAN said he was glad that reference had been made to the matter. The suggestion just thrown out was quite in accordance with the views of the Directors, but he feared it could not be adopted.

The SECRETARY read extracts from the Manager's report, in which he expressed an opinion that any additional charge in that way would be prejudicial to the interests of the Company, by causing a reduction of consumption.

Mr. WILSON agreed in the opinion expressed by the Manager, and argued that the policy of the Directors should be to reduce the price of gas, so as to bring it more fairly into competition with the use of petroleum for lighting purposes. He thought if they had adopted that course years ago, as he recommended, the consumption of gas would now be very much larger than it was, and the Company would have a firmer hold upon the public of Pará than they appeared to have.

The CHAIRMAN said he had no hesitation in asserting that, if the course recommended by Mr. Wilson were adopted, the shareholders would have no dividend at all.

Mr. WHITE was disposed to coincide to a great extent with Mr. Wilson in thinking that, by gradually reducing the price of gas, it would benefit the Company. As a Director of several Companies, he could say, from experience, that in almost every case reductions recouped themselves in a few years. Referring to the first item in the revenue account, he asked whether the Board were satisfied that there was any advantage in carbonizing wood.

The CHAIRMAN said, if they carbonized Newcastle coal alone, they would have much more coke than they could possibly get rid of. It had been found that it was more economical to carbonize wood and coal together. If there had been a good market for coke it would be otherwise.

Mr. WHITE said he could not conceive that there was any economy in making bad gas from wood, and then bringing up the quality by the use of expensive coal.

Mr. HENRY, alluding to the circumstance that the present meeting was delayed for some time for want of a sufficient attendance of Shareholders, suggested that the Directors should give notice to alter the Articles of Association, so as to reduce the quorum from 20 to 10 members.

The CHAIRMAN promised that all the suggestions made by the Shareholders should receive the attention of the Board.

The motion was then put and carried.

A resolution declaring the dividend recommended in the report was adopted, and the retiring Directors and Auditor were re-elected.

Votes of thanks were given to the Chairman and Directors, also to the Secretary and the other officers of the Company, and the Chairman and Secretary having acknowledged these compliments for themselves and colleagues, the proceedings terminated.

## PRESTON GAS COMPANY.

The Half-Yearly Meeting of Shareholders was held on Monday, the 18th inst.—Lieut.-Col. BURCHALL in the chair.

The following report was submitted:—

In presenting to the Shareholders the accounts of the Company for the year ending the 30th of November last, your Directors would observe that their anticipations of the effect which would be produced by the recent reduction in the price of gas have been verified, but not exceeded. The decrease of revenue for the year from that cause may be set down at £2600.

The increasing consumption of gas, which for the past year has amounted to 9 million cubic feet, gives reason to hope that this deficiency will be made up at no very distant date.

Another charge upon revenue has been produced by the transference from capital to revenue of a sum of £1500, which your Directors estimate as the value of the office in Glover Street, now closed in consequence of the completion of the new offices.

Considering these reductions to be merely exceptional and temporary, and the prospects of the Company being generally satisfactory, your Directors feel justified in again recommending the usual dividends of 10 per cent. per annum on stock A, and 7 per cent. on stock B. To carry out this recommendation, it will be necessary to resort to the reserve-fund, but it will be to the extent of £692 only.

The manufacturing plant at the Walker Street station, which has been undergoing considerable improvements, is now in full and satisfactory working condition. The storage for coal and coke at that station is dependent upon the closing of Appleton Row.

Your Directors hope shortly to obtain the necessary powers for accomplishing this object, and the area required will then be appropriated.

The whole of the stock B allotted in 1872 has now been called up. The sum of £33,000 still remains to be allotted.

The CHAIRMAN, in moving the adoption of the report, alluded to the satisfactory increase in the consumption of gas, and the desire of the Company to give the public every benefit in price and quality. He stigmatized a recent complaint in the Council of the impurity and deficient illuminating power of the gas as unjustifiable, as the gentleman making it was at the time in possession of the official report of the Surveyor of the Local Board that, both in quality and brilliancy, the gas was above the legally required standard. In many instances complaints of deficient brilliancy had been removed by the gas-fittings being cleaned, or the delivery-pipes enlarged. Attention to these points was necessary, as the pressure was now greater. With clean and larger pipes, and a modifying stop-cock, consumers would ensure greater illumination, and prevent the vitiated atmosphere caused by the escape of unconsumed gas. The attention of the Directors was unremitting to secure purity in manufacture.

The report having been adopted, the usual dividend was declared, and the Directors whose term of office had expired were reappointed with applause.

The meeting, after electing Mr. Davis as an Auditor, separated with the usual vote of thanks to the Chairman.



## INSTITUTION OF CIVIL ENGINEERS.

The first Meeting after the Christmas recess was held on Tuesday, the 15th inst., when the newly elected President, Mr. JOHN FREDERIC BATEMAN, F.R.S.S.L. & E., delivered an Inaugural Address.

After a passing allusion to the growth of the Institution, which at the end of 1844 numbered only 552 of all classes, now increased to 3189, reference was made to some of the addresses of the 18 gentlemen who had previously occupied the presidential chair, mainly for the purposes of comparison. Thus, Mr. Robert Stephenson, in summarizing the statistics of British railways to the end of 1854, mentioned that 368 millions sterling had been authorized to be expended, of which 286 millions had been raised; whereas at the end of 1876 these figures were respectively 742 and 682 millions. Again, Mr. Locke, in treating of French railways, remarked that at the close 1856 concessions had been granted for 7080 miles, of which 4060 miles were open; whilst at the close of 1876 these mileages, were 16,452 and 12,715. Mr. McClean had contrasted the income available for taxation in 1815 with 1856, and had shown that in the interval the revenue from land had not increased, while that from houses had augmented 300 per cent.; and from quarries, mines, iron-works, canals, railways, &c., 1200 per cent. There was evidence that since 1856 the increase had been very great, even if these high rates had not actually been maintained. These remarks showed how largely the Engineer had been employed, and how much his labours had contributed to the development of the wealth and prosperity of all countries where he had been engaged.

Proceeding to matters more personal to every member of the Institution, the President urged that engineering was, in fact, but the embodiment of practical wisdom; or, in the words of Bacon, "the conjunction of contemplation and action." Thought combined with practice had led to the perfecting of the steam-engine by James Watt, to the successful application of the locomotive engine by George Stephenson, and to the production of the electric telegraph. It was to the combination of sound theory with successful practice that engineering owed its present position, and had been able to advance material prosperity. It might, however, lay claim to more than that, for the works of the engineer had carried the blessings of civilization into every quarter of the globe; the steam-engine, in its various applications, had knitted together the most distant nations, ignorance had been brought into contact with knowledge, and heathenism with Christianity. On these grounds, and on others, the education of the engineer was of serious moment. In France, and on the Continent generally, where public works were mainly carried out by the Governments, engineers were educated in special schools, the theoretical information thus acquired being admittedly superior, as a rule, to that imparted in this country; yet the students lacked that practical experience which had hitherto been the main source of the success of the English engineer, who owed little or nothing to Government patronage, and whose employment depended on individual merit, the works being undertaken by private enterprise. Still, our young engineers were not always prepared, by preliminary education, as well as they might be for the subsequent acquisition of practical knowledge. Special qualifications, and some of a high order, were required, and it would be well if advantage were taken of the numerous public schools in which instruction bearing on engineering was given, with a view to prevent young men becoming pupils without these qualifications. But it must be understood that such training could only be regarded as preparatory, and not as being complete in itself; and it was a mistake and mischievous where any college or school professed to fit a student to act at once as an engineer.

The President then gave a brief description of a few of the principal engineering works recently completed, or at present under construction; mentioning, in telegraph engineering, the telephones of Mr. A. G. Bell and Mr. Edison—instruments which differed in construction, but by both of which the human voice, with all its modulations, could be transmitted to great distances. Then again, the quadruple system of telegraphy, imported from America, had also come into use. By this system two messages could be sent in each direction by the same wire at the same time. During the past year electricity had put forward other claims than those relating to means of communication. Thus, the electric light, if it could not at present compete successfully with the convenience in domestic arrangements of gas lighting, had been found useful and effective for the illumination of large spaces, and the invention was about to be applied at the Lizard Point Lighthouses.

In the conviction that experience of a special kind, gained during a long professional life, was of more real value than allusions, however lucid, to a variety of subjects, the President next adverted to a question which was of the highest importance in that branch of the profession to which his attention had been more particularly directed—viz., the rainfall of this country, and the quantity of water which flowed off the ground, available for the use of man if properly utilized, or destructive when uncontrolled and permitted to cause floods or torrents. The variation in the rainfall was very great. For instance, on the east coast of England and Scotland the average did not exceed 20 inches per annum; on the south and west coasts it was 35 or 40 inches; in the Penine chain of hills, forming the backbone of England, the quantity ranged from 40 to 60 inches; in the highest parts of Wales, Cumberland, and Westmoreland a fall of from 60 to 80 inches was reached, while in some parts of the Lake districts it amounted to upwards of 150 inches. The observations of Mr. J. F. (afterwards Dr.) Miller, of Whitehaven, showed that the maximum density of the rain cloud was at about 2000 feet above the sea level, although local circumstances exercise an important influence upon the quantity of rain which really reached the earth; that the greatest deposition of rain might be expected on that side of a mountain exceeding 2000 feet in height, upon which the rain cloud impinged, but on the opposite side when the mountains did not rise so high; and that in a succession of ridges and valleys, without intervening mountains of sufficient height to arrest the progress of the rain cloud, the greatest fall of rain would be in the first trough. In illustration, numerous observations on the rainfall in Lancashire and Yorkshire were given; and it was mentioned that the same results were observed in the Lake districts of Dumfries, Stirling, and Perthshire. As the quantity of rain varied in every district, and depended not only upon elevation but upon the physical and geographical features of the country, nothing could be more fallacious than to attempt to determine, by any fixed ratio, the amount of rain which would probably fall in any district, unless there were some corresponding one—similar in elevation, in proximity to the sea, in exposure to wind, and in other external circumstances—with which to compare it. The proportion of this very varying rainfall which would flow off the surface depended largely upon the geological character of the rocks, their elevation and declivity, and the manner in which they were clothed with vegetation. The water passed off partly in floods and partly in perennial springs; that issuing from springs varying according to the physical features or lithological character of the district. Absorbent rocks yielded the greatest abundance; next, loosely stratified rocks; and least of all, the closely bedded slate rocks and the primitive formations. Generally, in the coal measures, the millstone grit, and the primitive formations, the quantity of spring water in the driest seasons would vary from about one-quarter to three-quarters of a cubic foot per second per 1000 acres; one-half a foot per second per 1000 acres being an average quantity in a dry season. This quantity

formed, however, but a small portion of that flowing off the ground in times of flood, which exceeded 500 or 600 to 1000 times the quantity of water in dry seasons. The amount of flood waters was an important consideration in all engineering operations, as upon it depended the supply of large storage reservoirs, for canals, for water power, and for the use of towns; the openings of bridges spanning rivers, the construction of river courses, the drainage of lands, and the effect in "scour" upon the beds of rivers and upon the mouths of harbours.

## MIDLAND ASSOCIATION OF GAS MANAGERS.

At the First General Meeting of the above Association, held at the Midland Hotel, Birmingham, on Thursday, Jan. 10, the following Inaugural Address was delivered by the President, Mr. CHARLES HUNT:—

Gentlemen,—It devolves upon me to say a few words, as appropriate as may be to the occasion which has brought us together, although, in doing so, I fear lest I may exhibit you as models of patience, rather than prove myself worthy of the privilege with which you have honoured me.

In the first place let me congratulate this meeting upon the very rapid progress made by the Association, for, although, as yet, only three months old, it already numbers thirty members, a result which goes far to justify the most sanguine expectations which may be formed as to its future. On the threshold of this future, it may be well for us to consider what are the objects we intend to pursue.

Since the humble beginning made by Murdoch, in yonder factory at Soho, the history of gas lighting has been one of continuous development, so that now our industry finds employment in nearly every quarter of the globe. Regarded at first with scant favour, its manufacture looked upon as a highly mysterious occupation, more enlightened views have long since prevailed, new uses have been found for it, and the transference, in many conspicuous instances, of the duties and responsibilities of its supply into the hands of Municipal Authorities, may be fairly regarded as sufficient proof, if no other existed, that coal gas is looked upon at the present day as a public necessity.

The important position which it has thus acquired might be thought by some to furnish satisfactory evidence of a corresponding progress in its manufacture; but such does not appear to be the opinion entertained in many quarters, if we are to judge from the frequent admonitions addressed to us to put our houses in order. We are repeatedly told, both by Parliament and the public, that we do not supply gas either good enough or cheap enough; our own familiar friends turn round upon us, and accuse us of having "degenerated;" while—unkindest cut of all—from across the Channel has lately come to us a notice to quit the fair field of our labours so soon as our would-be successor shall have completed his arrangements for entering into possession of it. Under these, or indeed any circumstances, what can gas managers do better than unite their scattered forces, and consult together as to the best means to be adopted for the protection and advancement of the interests entrusted to their care? In forming this Association, we are but following the example set us by our professional brethren in all parts of the kingdom, still retaining undiminished our attachment to the parent Association, the labours of which, during the past sixteen years, in the promotion of a spirit of inquiry, and in the spread of information, have conferred infinite benefit upon gas manufacture. It is to be hoped that the day is near at hand when it and other kindred Associations will receive from those who, after all, are the chief gainers by them—namely, Gas Companies and Corporations, a yet more ample recognition than has hitherto been accorded to them, gratifying though this may be, for assuredly they fully deserve it.

During the past year or so the electric light has attracted considerable attention in France, where it has been applied for illuminating large buildings and open spaces; and opportunities are now afforded us for examining in this country its claims to public favour. There can be little doubt that much progress has, of late years, been made by way of perfecting its application, and the efforts of electricians have been partially successful in dividing the current of electricity, so as to produce, from the same source, a limited number of lights, or candles, as they are termed; but it is difficult to conceive that gas shareholders or corporations have anything to fear from it as to the value of their property, so long as it lacks so conspicuously that power of adaptation to varying requirements, the possession of which has contributed so powerfully to the success of the system of gas lighting.

Competition, to a limited extent, we may very likely experience in the immediate future; but there is room for both systems, and, if the rivalry so induced should act upon us as a stimulus to further exertion, by way of cheapening and extending the use of gas, it will by no means be a matter for regret.

We are, indeed, spurred on to such exertions by a variety of motives. Parliament, in its wisdom, has thought fit, during the last year or so, to adopt a new principle in gas legislation, by imposing upon some of the metropolitan, and also upon a few provincial companies, a sliding scale of dividend, so that henceforth the amount of this latter will depend in their case, to a considerable extent, upon the selling price of the gas. Thus a sort of speculative element is introduced, or payment by results, as it has been termed, which would appear to operate to the advantage alike of both buyer and seller; but originating in a doubt, believed, by some at any rate, to have been ill founded, as to the *bona fides* of the Companies, it seems not unlikely to prove of greater benefit to them than to the consumers, in whose interest especially the proposal was framed. In fact an abnormal condition of things, such as was the late coal famine, during the existence of which the new regulations would, in all probability, operate in favour of the consumer, can never be lasting, and must always be far outweighed by succeeding years of comparative tranquillity.

In another direction Parliament is likely to be more successful in limiting the profits of the Companies, for by the auction clauses now generally inserted in new Acts, the Shareholders are deprived of the premiums on fresh issues, while, at the same time, the question as to what is a fair dividend on gas capital, respecting which the decisions of the Legislature have been anything but consistent, is practically referred to the investing public, who may be relied upon to settle it to their own satisfaction, and, let us hope, to that of all other interests concerned. It would seem that the creation of non-dividend bearing capital, amounting practically to a reduced charge for dividend on all future issues, must tend ultimately to strengthen the position of the Companies, while the benefit to the consumer will prove immediate in its effect.

Cheap and pure gas being the desideratum, what can we do more than has been done in the past to further its attainment? We have been told very recently by Mr. Livesey (than whom no one can be more devoted to the interests of his profession) that gas manufacture, since its commencement, has not made the same progress as other manufactures, and he attributes this in a great measure to the absence, in the case of gas managers, of any direct pecuniary interest in the success of their several undertakings. A similar opinion has likewise been expressed by Mr. Bennett, in the paper which he read last June at the meeting of the parent Association, and what he says upon the subject, as coming from one who is not himself a gas manager, deserves our serious consideration. Mr. Bennett, indeed, does not hesitate to express his conviction that a much more extended and profitable business is likely to reward the efforts



of those who take the pains to seek it, and there must be many who think with him. While, however, agreeing cordially with much that has been advanced by both gentlemen, I feel by no means convinced of the soundness of their conclusions as a whole; or that gas managers, as a rule, deserve all that has lately been said of them. There is no doubt that competition and self-interest form two most powerful motives for exertion, but can it be said that either of them has been absent or untied in our case? Competition, for instance, existed until recently in almost all our largest towns, but it is not apparent that any one of them has ever been able to boast of having distinguished itself by any special progress in the art of gas manufacture, nor is it by any means clear that the amalgamation of the undertakings has in one single instance proved detrimental to their development. In London, until about 1860, competition existed in its most virulent form; but was the period immediately preceding 1860 noted for anything more famous than the establishment of the Great Central Gas Company, the natural outcome of the wasteful systems which then prevailed; and is it not a fact that the districting arrangements, by which at length competition was put an end to, have proved of the greatest possible benefit alike to Shareholders and Consumers? Those who, being dissatisfied with our present rate of increase, are casting about for a cause for it, will hardly find one to their liking in the entire absence of competition at the present day; competition between gas undertakings has been tried and found wanting.

Probably we are all agreed with Mr. Livesey that gas managers ought to be sharers in the wealth they help to create, and, in the absence of such participation, it is not surprising that they are occasionally wanting in that absorbing interest in their profession, often to be found in other branches of industry. There can, I think, be little doubt that the general adoption of a system of payment by results would prove advantageous all round, and there can but be few who would not welcome such a change; but the difficulties in the way of its adjustment are great, although, probably, not insurmountable; and it is to be observed that, while justifiable solely from a commercial point of view, the commercial aspect, pure and simple, is fast disappearing from gas undertakings, through their absorption by local authorities.

Notwithstanding, however, the absence, as a rule, of any such special motive for exertion, so abundant is the evidence of a general spirit of inquiry existing amongst them, isolated though they be, that it is impossible to say of gas managers as a body that they are not keenly alive to the interests of their profession, nor as zealous and energetic in the service of their employers as any set of men can possibly be. Whatever may be the reason for the apparent want of progress exhibited in our art since its infancy, it is hardly to be ascribed to the supineness or indifference of those whose daily occupation it has formed. Nor can it be attributed to any lack of interest on the part of scientific men and others outside the profession, for numberless have been their efforts to improve us, as the records of the Patent Office bear witness. Every few years has brought out a succession of new schemes, or old ones revived, the names of which, still living in our memories, are all that remain of once promising inventions, for few indeed have passed beyond the experimental stage, and all, without exception, after lingering for a while in the speculative regions—too often speculative in more senses than one—have disappeared, serving no other purpose, it would seem, than to show how utterly incorrigible we are.

Nevertheless, the demand for coal gas as originally distilled, condensed, purified, and distributed, has gone on increasing, until its supply has become the gigantic industry we now see it. Are those who have devoted the best part of their lives to its development not entitled to any credit for the enormous proportions it has assumed, and are not the failures to which I have referred to be attributed, in some degree, at least, to something inherent in the nature of the thing striven for? Is it nothing to have reduced the selling price to about one-fifth or one-sixth of what it was originally, thus bringing what was formerly a luxury to within the reach of the humblest in the land, and to have achieved this result without the aid of any material alteration in the process itself, a process which has, over and over again, been demonstrated to be, in its main features, unalterable? Whatever science may yet have in store for us—and she can by no means have exhausted her aid—the rise and growth thus far of the system of gas lighting will remain an enduring monument to the skill and energy of our predecessors.

If, however, science has been less active on our behalf than for others; if some amongst us, conspicuous for talent, have found in other pursuits that field for their ingenuity which appeared to be denied them in our own, at least we can say that assistance of a very substantial nature has not been wanting to us. Thrift is the good genius whose help in the past has materially contributed to the prosperity of gas undertakings, by lessening the cost of production; and it seems not unlikely that in the future the most solid success will still reward those who continue to invoke her aid. Although many degrees removed from the waste which at one time was deemed to be unavoidable, much remains to be accomplished; as is made evident, for example, by a comparison of the total weight of products accounted for with the original weight of coal submitted for distillation. It is no exaggeration to say that the loss of gas, through pressure unwisely permitted at the moment of evolution within the retorts, and by leakage through defective distributing plant, amounts to from 15 per cent. of the total quantity generated in the best managed concerns, to 80 or even 40 per cent. in those which are less efficiently conducted. So large an amount of valuable illuminating matter lost to the world demands from us our best efforts for its recovery; for this is surely a "consummation devoutly to be wished" for, and, viewed in the light of past experience, by no means hopeless of attainment. The late Mr. Esson, of Cheltenham, long ago set us an example of what could be achieved in the way of improved carbonization by relieving the retorts of the pressure caused by the dip-pipes, and I trust that at some future meeting his successor, our esteemed fellow-member, Mr. Paterson, may be induced to relate to us his experience in this direction. At the same time, signs are not wanting to show that those who have already succeeded in reducing their per centage of unaccounted-for gas to a moderate 6 or 7 per cent. are by no means disposed to "rest and be thankful," so that we may fairly believe that the time is approaching when we shall be able to account on the right side of the balance-sheet for all but an insignificant portion of the entire weight of coal delivered into the retorts.

On the subject of retorts, it is to be observed that machinery has lately been adopted in their manufacture, and it is claimed that not only is the cost thereby lessened, but that, being rendered more dense, the durability of the article is improved. On this latter point our experience is, perhaps, as yet, too limited to express any decided opinion, but so important a feature is not likely to be lost sight of.

The problem, how to dispense with, or diminish, the necessity for hand labour within the retort-house, has occupied much attention for a great number of years, until at last, after many failures, a gleam of success seems to be rewarding the persevering efforts of those who have devoted themselves to its solution. Foulis's hydraulic stoker may be said to have taken firm root in Manchester, where it is found to effect a considerable saving in the cost of carbonizing, and it is also under consideration for adoption at the Beckton works; while West's machines, coupled with the

system of light charges at short intervals, are finding favour in many quarters.

Mr. Eldridge, of Richmond, very courteously gave me the opportunity, a short time ago, of viewing those in use at his works, and what I saw pleased me very much. Speaking generally, the endeavour to render automatic the present method of charging by hand, has usually resulted in an enormous waste of power, with only partial success; but Mr. West, by separating the two operations to be performed—namely, lifting the coal and putting it into the retorts, has avoided a difficulty which has too often proved fatal, and produced a machine at once simple, unpretending, and undeniably effective in diminishing to a great degree the necessity for manual labour. We may fairly welcome the introduction of these machines as a step in the right direction, and a valuable contribution to one of the most pressing questions of the day.

The system of light charges at frequent intervals, as practised by Mr. West, can hardly be described as new, inasmuch as it prevails to a considerable extent upon the Continent, where it is said to be productive of very satisfactory results. Certain it is that light charges are found to work off more gas per ton than heavy ones; and indeed upon this point it may be said, that a more intimate knowledge of the conditions under which evolution proceeds within the retort will inevitably reveal to us the fact that carbonization, as commonly conducted, is by no means the economical process that it ought to be. We may well believe that, without the aid of any adventitious methods, such as are almost daily forced upon our attention, and which are too frequently only so many blows aimed at the simplicity of the process, a greatly increased yield of gas is possible of attainment, and to this end our efforts should be directed.

The value of residual products, notably of tar and liquor, has undergone a complete change of late years, so that what were formerly little better than drugs in the market now contribute materially to the revenues of gas undertakings. Fortunately, it is almost needless, at the present day, to direct attention to the complete extraction of ammonia as our bounden duty, for, regarded solely from a commercial point of view, the suicidal policy of negligence in this respect is sufficiently obvious; and yet only a few years ago such neglect was all but universal. It may be said, "How shortsighted must the Companies have been to allow such a state of things to continue for so long a period!" And there is much truth in such criticism, for too often this source of revenue has been overlooked. But then, on the other hand, it must be recollected that ammoniacal liquor, for a very long period, was worth very little; and also, that chemists were, at one time, by no means agreed as to the advisability of the complete removal of ammonia from the gas, it being urged, among other reasons for its retention, that its presence hindered the deposition of naphthalene. Whatever foundation there may have been for such belief, it is probably sufficient for us to know that such considerations have disappeared before the rapidly advancing value of this product, the proper place for which, it is now universally acknowledged, is not in the gas, but under the ground.

The exhaustion of the guano deposits has turned the attention of agriculturists to sulphate of ammonia as one of the chief sources whence to derive their supply of nitrogen for the soil, and the demand thus created, increased by the ever-growing necessity for higher cultivation, has been eminently favourable to its disposal. The result is consequently what we now see it, that gas liquor has maintained its position in the market throughout a period of almost unparalleled depression, affecting adversely every other product; nor is there any reason to believe that it will not continue so to do, for, in the opinion of the most competent judges, a yet greater demand may be expected for it in the future.

But not only is the gas manufacturer indebted to ammonia for a most important contribution to his revenue, it is at the same time a very valuable agent in the removal of the remaining impurities, and as such should be employed to the utmost possible extent before its final disposal. Indeed, purification by its means, in closed vessels, offers so many advantages over the ordinary methods that, as might be expected, many attempts have been made to supersede the latter, either wholly or in part, by perfecting the application of the former. If only ammonia were produced in sufficient quantity with the gas, then indeed the work of purification would be simply and inexpensively performed, and we should probably hear no more of the much vexed question of the sulphur compounds; but, as it is, we have to cast about for means whereby the quantity at our command can be employed over and over again. Hills's method, as practised by Mr. Livesey, enables this to be done to a considerable extent, and other processes are now offered having the same object in view, so that it can scarcely be a matter for speculation as to whether in the future ammonia will not come to the front as our primary purifying agent. Be it always remembered that coal gas contains within itself the materials for its own purification; it is for us to find out the proper means of employing them.

From the necessity for the removal of sulphur compounds other than sulphuretted hydrogen, gas managers in the provinces are, as a rule, exempt; for, with few exceptions, it is only the Metropolitan Companies who are subjected to pressure in this respect. The attainment, however, of a high standard of purity is really a matter which concerns us all, if we would extend, by every means in our power, the use of gas wherever applicable. There can be little doubt that the too often noxious character of the products of its combustion has hitherto retarded its employment for many purposes, and although overcome to a great extent by more perfect ventilation, it is surely, at least, as much our duty to endeavour to remove the cause, as it is to point out a remedy for the inconvenience complained of. While, therefore, sympathizing to the fullest extent with our brethren in the Metropolitan in the difficult position in which the demands of the public have placed them, I think we should be wanting in appreciation of the necessities of the case did we not endeavour to meet those demands, rather than denounce them as unreasonable and exacting.

In designing gas-works, it is, of course, of the last importance that the details should be so arranged as to enable the various operations to be conducted with the greatest possible ease and consequent economy; nor will it now-a-days be admitted, as a sufficient excuse for want of efficiency, that they were originally planned to suit a condition of things no longer existing. Our position with the public depends upon our being able to supply a cheaper source of light than they can obtain elsewhere, or by other means, and we cannot afford to neglect any precaution by which such position may be strengthened; otherwise, the lightest penalty that may ensue will be diminished profits, with attendant loss of capital.

Of the attention which has of late years been bestowed upon every part of the apparatus of gas-works, tanks and holders have naturally attracted to themselves by no means inconsiderable share. In the construction of tanks, Portland cement concrete is now extensively employed, and where suitable material for it can be obtained upon, or near to, the site of the works, its cost compares favourably with that of brickwork; but it can hardly be said to be equally reliable, and needs to be used with caution, especially where the foundations are uncertain. In the present imperfect state of our knowledge as to the proper methods of mixing and applying concrete, it would seem that its use in blocks, bedded and jointed in the same way as stone, offers the best guarantee for stability, when employed for the construction



of tank walls. Where such stability can be ensured, whether by means of brickwork or concrete, there can be little doubt but that, in Portland cement rendering, we have a cheap and efficient substitute for clay puddle.

With regard to gasholders, the chief points of interest are the wrought or cast iron stanchions which, in a few instances, have been preferred to the ordinary cast-iron columns for the outside framing, and the abandonment of the trussed roof. In point of economy little is to be gained by the adoption of the stanchion; but it possesses, in the eyes of some, the merit of being lighter in appearance, and of having its strength concentrated in the direction in which it is most required; although, on the other hand, a column properly designed is capable, with the same weight of metal, —cast for cast—of resisting the utmost strain to which it may be exposed in any direction.

The abandonment of the trussed roof, in holders of any considerable dimensions, materially reduces the cost of the structure, and, by diminishing the weight of the crown, adds to its stability; but, at the same time, a somewhat indefinite dread of the strain which, when the holder is in action, is supposed to be thus thrown upon the curb, has led to the strengthening of this latter to such an extent as to make a serious inroad into the previous saving. If, however, I, for one, entertain grave doubts as to the necessity for such precautions, it is because I am unable to conceive of any strain greater in extent than that which is due to the weight of the holder distributed; and that this is counterbalanced by the pressure within, exerted by the gas equally in all directions, is capable of easy proof. Consequently, the hope may not be vain that a problem which has engaged the attention of some of our best mathematicians without result, will find a safe and practical solution in the gradual return to that simplicity of design which in the curb was formerly deemed adequate.

Well, gentlemen, when we have constructed our works upon the most approved modern principles, when we have done our best to apply to our manufacture all the most economical and efficient methods, and delivered our gas to the consumers with a minimum of loss, is there anything remaining for us to do? Yes, say our critics, your work is by no means complete, for you are nothing if you are not versatile. You should be prepared to advocate the claims of gas in season and out of season, and, by means of lectures and exhibitions, endeavour to familiarize the public with the many and economical uses to which it may be applied. By so doing you will impart an additional stimulus to your business, the good effects of which must soon become apparent, and, at the same time, you may, perhaps, succeed in removing some portion of the unpopularity which unfortunately too often attaches to gas undertakings.

We can hardly fail to recognize the soundness of this most friendly advice, nor, if possessing the necessary qualifications, should we hesitate to act upon it. It may be, however, that, as individuals, it is not permitted us to do all that we could desire in furtherance of an object so eminently calculated to promote our best interests, but as an Association it ought to be in our power to accomplish a great deal. Let us not, then, shrink from joining those who are already at work in the wide field before us, remembering always that our first aim is to cheapen production; but if, in addition to effecting this, we succeed, as time rolls on, in becoming, by its agency, better exponents of the article we manufacture, then surely this Association will not have existed in vain.

#### ABERAVON CORPORATION GAS-WORKS.

Profit and Loss Account for the Year ending Aug. 31, 1877.

Coal . . . . .	£253 1 10	Gas-rental . . . . .	£811 15 1
Wages . . . . .	252 2 8	Meter, &c. . . . .	41 18 10
Lime and carriage . . . . .	8 12 0	Coke, tar, and refuse lime . . . . .	74 6 10
Repairs, &c. . . . .	69 7 4½	Gas to public lamps . . . . .	198 0 0
Salaries . . . . .	37 2 0	Fittings . . . . .	2 5 6
Rates and taxes . . . . .	26 9 10	Meters sold . . . . .	11 9 6
Haulage . . . . .	50 13 0	Deposits received . . . . .	3 0 0
Tradesmen's bills . . . . .	67 2 8		
Relaying and new services . . . . .	110 3½		
Incidental expenses, including printing and stationery . . . . .	7 9 11		
Meters . . . . .	13 10 3		
Law charges . . . . .	35 5 6		
	£962 12 4		
Balance carried down . . . . .	280 3 5		
	£1142 15 9		£1142 15 9
Interest on loans . . . . .	£268 5 1	Balance brought down . . . . .	£280 3 5
Banker's interest and commission . . . . .	40 11 5	Balance profit, Aug. 31, 1876. . . . .	49 0 11½
Costs of inquiry . . . . .	4 14 0		
Deposits repaid . . . . .	2 0 0		
	£315 10 6		
Balance . . . . .	13 13 10½		
	£329 4 4½		£329 4 4½
<b>Capital Account.</b>			
Loans, Aug. 31, 1876 . . . . .	£4825 15 11	Expenditure to Aug. 31, 1876. . . . .	£5652 2 11
Do. since . . . . .	1800 0 0	Expended since—	
	£6625 15 11	New purifiers and condensers . . . . .	207 5 11
Less loans paid off . . . . .	701 13 11	Purchase of lands . . . . .	119 15 6
	£5924 2 0	New mains . . . . .	332 1 7½
Balance . . . . .	424 19 2½	Office furniture . . . . .	5 10 6
	£6349 1 2½	Meters . . . . .	32 4 9
			£6349 1 2½

#### WATER SUPPLY FOR NEW YORK CITY.

The last plan submitted to the Special Committee on Water Supply for New York City is by a Brooklyn engineer, who claims a cheaper mode of getting water than by going 60 or 60 miles for it. His plan is the construction of a close canal or conduit, on a low level, of sufficient width and depth, commencing at Harlem River, running through Westchester, following the lowlands, and keeping the depth below the well level. This conduit, he states, would always be full of the purest water, supplied from the great underground water-basin of Westchester, and would in its course intercept all the springs and streams. Having studied the water supply of Brooklyn, he was led to make a proposal to furnish that city with a future supply at a much cheaper rate than could be obtained by building reservoirs, and he thinks the same plan would be applicable to New York, although the soil is very different. The soil of Long Island is of such a nature that it readily absorbs all the rainfall. What streams there are come from springs fed from the higher grounds. The soil of Westchester is different from that of Long Island; it is harder and more compact, and much more of the rainfall runs off the surface; that which is absorbed remains longer in the soil. Hence a long drought would not affect the wells in Westchester as much as those on Long Island. The Brooklyn conduit, which carries the water to the pumping-wells, was built as low as possible, in order to collect the water from the different springs, yet built above the well level; and, by extending it, sufficient

elevation to the mile was given to impart the necessary current to send the water to the pumping-wells; till now, in 17 miles, it has risen above the springs, and no more water can be obtained without building reservoirs, or adopting the plan he suggests. The conduit for New York was built high in order to get an elevation without pumping, and was carried back 40 miles to the high ground of the Croton, passing many streams, and getting no advantage from the many valleys in its course, or from the great watershed lying within 30 miles of New York—resources sufficient, if improved, to give an abundant supply for all time.

It is contemplated to build more reservoirs on these high elevations, at a cost of 10,000,000 dol., and to build a new conduit between New York and Croton Dam at a cost of 10,000,000 dol. more. In regard to this, he says, to keep building expensive reservoirs on these high elevations is a waste of public money, and will natrally prove a failure as to a future supply, for, as the line is extended, it must keep rising, although already it is above the springs. What water may be obtained in this way is from storm flows, collected during the time of freshets, and retained in their shallow basins, stagnant pools, exposed to the rays of the sun, and infected by vegetable decomposition, with no circulation whatever until it is let off into the conduit, thus distributing the seeds of malaria. The best place for reservoirs is where you can get the purest water, and that is at the foot of the hills. Here not only the surface flow is got, but as much more pure spring water, filtered through the upper lands. The expense of pumping will not compare with that of building costly reservoirs on such high elevations; but even if it did, the sanitary advantages would more than compensate. As the land naturally rises from Harlem River, a conduit could be built, on a slight elevation to the mile, of sufficient width and depth to bring to the city as much water as would be needed for all future time. The water in the canal would be spring water and a running stream. The pumping-engines could be placed at the Harlem River, and pump directly into the pipes, under pressure, giving the water sufficient force to carry it into the top storey of the houses on Murray Hill, leaving the old aqueduct, with its reservoirs, to supply the lower portion of the city.

In brief, the plan is to have one main conduit, commencing at a point west of King's Bridge or east of Central Bridge, on the Westchester side of the Harlem River, extending up through Westchester, with lateral branches, running right or left, as the nature of the ground may indicate; smaller ones to be built in each of the different valleys, and a cross tunnel made to intercept them all. By this means a large amount of water could be obtained, and the conduit could be extended according to the growth of the city. The main conduit, at the commencement, would not be less than 12 feet in diameter, or of sufficient capacity to deliver 200 million gallons daily; it could be diminished as extended. The side walls of the conduit would be of heavy stone laid dry, backed up with small ones, the bottom paved with cobble stone, and the top arched with brick laid in cement. The pumping-wells and buildings could be erected on the New York side of the Harlem River, the river to be tunnelled with either an iron or a brick tunnel of the same dimensions as the conduit, the top to be 12 feet below low-water mark. All the overflow would empty into Harlem River.

An approximate estimate of the cost of such works, with five compound steam pumping-engines of the most approved kind, with their boilers, fixtures, and buildings to pump 100 million gallons of water per day, is 9,500,000 dol., exclusive of the right of way, which would not cost much, as the conduit would be mostly underground. Much of the tunnelling could be done without disturbing the surface. The principal and only damage would be the surplus earth left in places. As the conduit would follow the low lands, their drainage would mitigate damages. — *Scientific American.*

#### IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

If the Eastern Question were to assume any more definite phase, there seems to be very little doubt that an improvement of trade would at once result. In some quarters, indeed, a rather more hopeful feeling prevails now that the intentions and policy of the Ministry have been explicitly detailed, and not a few persons are inclined to the belief that there will very shortly be more business doing. At some of the large works, indeed, there is already more work in hand, although there is evidence that many of the new orders have been taken at prices which cannot, by any possibility, leave much, if any, margin of profit. This is especially the case with the rail contracts recently placed, not only here, but in other parts of the country. One very noticeable feature of the times is, nevertheless, the fact that, despite the depression about which there is so much complaining, nearly the whole of the blast furnaces in the county of Derby are at work, so that whatever the prices may be, there is evidently a demand somewhere or other, as we cannot suppose that all the ironmasters would be either willing or able thus to continue working simply for stock alone. It is also stated, but of this I cannot make any assertion from personal knowledge, that all the furnaces in Leicestershire and Notts are also in blast. In this vicinity matters are hardly so good, seeing that there are still several furnaces standing idle, and in North Lincolnshire the production is only on a limited scale.

So far as pig iron prices are concerned, there is little that is new to be reported, inasmuch as in almost every transaction special quotations are negotiated. Generally speaking, however, very little change has taken place, and the competition amongst vendors is so close that buyers, on the whole, have rather the better hand. In finished irons very little business is being done.

Coal and coke are selling fairly well, but prices are cut excessively low, owing to the enormous output which is being produced on all sides. I hear of locomotive coal being sold to Railway Companies at under 6s. per ton, and of various sales of steam coal at very little over 6s. 6d., or from that to 7s. In no case is there any difficulty in fixing deliveries and obtaining them regularly in accordance with buyers wishes.

#### THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is still no sign of any material improvement in either the coal or iron trades of this district. In a few cases where colliery proprietors are pretty well covered with contracts for gas coal, they are endeavouring to secure a slight advance upon the better classes of round coal suitable for house-fire purposes, and in several instances 6d. per ton more money is being asked for Pemberton four-feet and some of the Wigan mines; but as there is no general pressure of orders in the market, and supplies, as a rule, are plentiful, it is only in exceptional cases where any advance can be obtained, and prices, as a rule, are the same as last week; the average quotations at the pit mouth being 10s. to 11s. per ton best Wigan Arley, 8s. to 9s. for common ditto, 8s. to 9s. for Pemberton four-feet, and 6s. 6d. to 7s. 6d. per ton for the better classes of common round coal. Other descriptions of fuel continue most difficult to move, and orders in bulk can be placed at very low figures. Common coal for forge and steam purposes is only in very limited request, and is offered at from 5s. 6d. to 6s. 6d. per ton. For good burgy, 5s. 3d. to 5s. 6d. per ton is obtained; but the



common sorts do not fetch more than from 4s. 6d. to 5s. per ton. For best slack, 3s. 6d. to 4s., and in some cases 4s. 6d. per ton is being obtained; but there is a good deal of this class of fuel being pushed in this district by Yorkshire firms, and common slack is being offered in the market at almost any price ranging from 2s. 3d. to 3s. 3d. per ton.

There are still very few orders in the market, either for foreign or coastwise shipment, and the houses that have to depend largely upon this branch of trade are quoting extremely low prices to secure business, common steam coal at the high level, Liverpool, being offered at less than 7s. per ton.

Local makers of iron find it very difficult to secure orders in consequence of the underselling which they have to encounter from producers in other districts. They are, however, able to keep the few furnaces in blast going, and are firm in maintaining late rates, which, for delivery into the Manchester district, remain at 51s. per ton for No. 3 foundry, and 50s. for No. 4 forge, less 2½ per cent. For finished iron there is very little inquiry, and works, as a rule, all through the district, are extremely short of orders. North country bars delivered here are offered at very low figures, and can be bought at from £6 3s. 6d. to £6 5s. per ton, whilst 2s. 6d. per ton more money is asked for local makes.

A reduction of 5 per cent. in the wages of finished iron workers has been effected in this district without any serious opposition on the part of the men.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

What contracting was done last week for the best qualities of gas coals was about 7s. 6d. per ton. There is no great pressure, however, in the way of pushing business, and there seems a disposition to wait until the end of the strike in the steam collieries, and see the result of an armistice, before entering fully into trade. There is a prospect that an arrangement will be come to between the Northumberland coal owners and pitmen to adopt a sliding scale. Notwithstanding the Northumberland men have been out three weeks, business at a great number of the Durham collieries is really in a very poor dull way. Some pits are standing, and others are only doing six days a fortnight. The short time, however, is mainly amongst the small second-class pits, which have a very hard struggling time of it in tolerably good times, and which can only pay a profit to the owners when business is brisk, and prices are comparatively high. All the best and medium gas collieries are working full time. But to show there is nothing extra in the trade, it may be mentioned that loading turns are, at the shipping-places, very nearly immediate, or at most two or three days. The house collieries on the Wear are bringing their work up very well; but there is a good deal of broken time. Of course, there is no business of any value as in the Northumberland coal-fields. Masters and men are made to feel the consequences of going to war. Trade is being driven away to other districts, and it is a question whether it can be got back again. The present generation of Northumberland pitmen have experienced, and are likely to, for the first time in their lives, something very like destitution. The people are not absolutely starving, but there are a great many families who are extremely ill off.

The coasting freight market could not well be in a more depressed state than it was last week. Small sailing ships came dropping in, but they had been engaged previous to leaving their homes by the Gas Companies, and after discharging corn, flour, and other cargo, loaded up gas coals for the South. The rate of freight for steamers to London was from 4s. 1½d. to 4s. 3d., with very little inquiry. Some cargoes were shipped for the northern ports of France, and about half a dozen steamers loaded gas coals for Italian ports. Cargoes of gas coals were also shipped to Ireland. The shipments abroad were limited to gas coals.

The general manufacturing trades of the Tyne and Wear get on somehow. There is rather a large amount of iron steam tonnage building; launches of steamers are occurring every week, but the builders have not many new orders upon their books. The manufactured iron trade is doing a little better probably, but very little profit can be had out of manufactured iron at present prices. There is a great abundance of labour in all branches of trade, and wages are lower. It may be roughly estimated that, taking employment all round, wages are 2s. 6d. per week less than last year at this time. The ordinary labouring men feel the pinch of the times bitterly, and unskilled labour has had to abate its pretensions considerably lately. In fact, if there were not a good deal of work on hand in the iron ship-building yards, labourers would have to submit to much lower wages than they are even doing now.

## TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

A special meeting of the Police Commissioners of Kirkintilloch was held a few days ago, for the purpose of resuming consideration, and, if so resolved, of approving of a resolution adopted by them on the 6th of September last—viz., "That the Burghs Gas Supply (Scotland) Act, 1876, be adopted in and applied to the burgh." The motion was unanimously agreed to. A movement has been since set on foot against the adoption of the Act, and a poll of the ratepayers may have to be taken on the subject.

The ratepayers of Elgin have approved of the action of the Town Council in adopting the Burghs Gas Supply Act. The matter went to the vote last Tuesday, when the following result was announced at the close of the poll:—For transference of the gas supply to the town, 176; against, 84; majority for the Council, 92.

At the ordinary monthly meeting of the Town Council of Hamilton, held on Thursday week, the state of the gas-works was under consideration. The Gas Committee, in order to meet the increasing demand for gas, which, with present storage accommodation, they were unable to supply, recommended the construction of an additional holder, to be erected behind the present works on the feu last taken off. The Committee had submitted the matter to Mr. Barr, C.E., who reported that the present condition of the works was not very satisfactory, and in more respects than want of gasholder room they were behind the requirements of the burgh. The three holders now in use gave an effective cubic capacity equal to about 100,000 cubic feet, or two-thirds of the present requirement. He indicated where a new holder of 75 feet diameter could be erected. Such a holder, with telescopic lift, would increase the capacity 164,000 cubic feet; and a further increase could be made by telescoping the present 50-foot holder, which would further increase the capacity 30,000 cubic feet, or a total of 294,000 cubic feet. The present exhauster was notoriously insufficient, and the scrubbers, purifiers, and meter were likewise too small, and in such positions as to prevent their extension. He pointed out an arrangement of the works which would duplicate them. The probable cost of the 75-foot holder he estimated at £5000 to £6000. The Committee recommended that estimates be taken for the gasholder meantime, leaving other improvements suggested for further consideration. After a good deal of discussion, the recommendation was approved of. In regard to the price of gas, Bailie Cassels stated that the remit as to reducing the price of gas had been considered, and that the Committee had resolved that it should not be altered till the end of the financial year.

On the 11th inst., the Glasgow Corporation Gas 9 per cent. Annuities were raised £2 at 216, and on Tuesday last they were further advanced in price, the day's transactions closing at 218. The 6½ per cent. Annuities were also advanced to 163½.

During the week ending Jan. 12, Dr. Wallace found the Glasgow gas to give the following results in respect of illuminating power:—Minimum ranging from 25.43 candles to 26.72 candles; maximum from 26.84 candles to 29.18 candles; average from 26.25 candles to 27.61 candles. The western district showed the highest results.

In accordance with a recommendation of the Greenock Corporation Gas Committee, the Police Board of that town, at their usual monthly meeting held last week, agreed to hand over to the Charitable Society 100 tons of coke free of charge, and to supply additional quantities at the rate of 2s. 6d. per ton.

At the usual fortnightly meeting of the Chemical Section of the Philosophic Society of Glasgow, held on the evening of Monday, the 14th inst.—Professor John Ferguson, M.A., President, in the chair—a paper was read by Mr. John Mayer, F.C.S., Secretary of the section, on "Hislop's Improved Process of Regenerating the Lime used in the Purification of Coal Gas." Amongst the gentlemen present there were Councillor Dron, member of the Corporation Gas Committee; Dr. Wallace, Gas Examiner for the city; Mr. James R. Napier, F.R.S.; and a number of Gas Managers, including Mr. Samuel Stewart, Greenock; Mr. James Hislop, Maryhill; Mr. G. R. Hislop, Paisley; Mr. William Key, Tradeston; Mr. James Robb, Ayr, &c. A long and interesting discussion followed the reading of the paper.

On Saturday week the Police Commissioners of Blairgowrie, along with Mr. Young, C.E., Perth, met to hear any objections that might be urged to the proposed drainage scheme. No objections being made, the Commissioners resolved to proceed. Seventeen offers for the drainage works were subsequently opened in private by the Commissioners, and it is said that the tenders ranged from under £9000 to over £5000, a Dundee offer being the lowest. No decision as to the acceptance of any offer was arrived at.

At their last meeting the Nairn Burgh Police Commissioners agreed unanimously, at the suggestion of the Board of Supervision, to take the preliminary steps for a general system of sewerage for the Burgh, and to apply to the Loan Commissioners for a loan for this purpose, as also for satisfactorily completing the water-works. A committee were appointed to select an engineer of experience.

There have been one or two slight "spurts" in the way of a rise in the price of pig iron during the past week in the Glasgow market; but the week closed on Friday with a steady market, and business done at 50s. 9d. and 50s. 10d. cash.

Nothing new has arisen in the coal trade, except, possibly, a feeling of depression caused by the failure of two firms closely connected with the foreign shipment of coals.

EXPLOSION OF GAS AT BACUP.—Last Tuesday evening, about six o'clock, an explosion of gas took place at Lee Mill, near Bacup. At the time Mr. John Rushton, slater, and his family were at tea, when they perceived a strong smell of gas, which was soon followed by a loud report, upheaving the house floor the moving of the table and dresser, and the clinking of crockery. A policeman who was passing at the time also felt the footpath lift under him, and saw a blue light on the other side of the road beside the railway line. Information was at once given at the gas office, and a staff of men were set to work to find the leakage. The gas-main at the place in question is 20 inches in diameter, and it is presumed that the main had been damaged, probably by some heavy weight passing over it, and that the liberated gas had found its way into the drains of Mr. Rushton's house, and, coming in contact either with the fire or the lights in the kitchen, ignited. Fortunately no personal injuries were sustained.

SALES OF PROVINCIAL GAS SHARES.—On the 8th inst., £400 worth of consolidated stock in the Cambridge University and Town Gas Company was sold by auction in eight lots, of £50 each. The biddings began at £90, and ended at £100, the stock thus realizing cent. per cent. On the 16th inst. 8000 shares of £5 each in the South Bank and Normanby Gaslight and Coke Company, Limited, were offered for sale by public auction at Stockton-on-Tees. The shares were offered for sale by auction in accordance with the provisions of the Company's Provisional Order of 1877, which limits the dividend to 7 per cent., subject to the sliding scale of dividend, *pro rata* with the price charged for gas. The conditions attached to the sale set forth, *inter alia*, that nothing had been paid or called on the shares; that the amount of premium bid on each share would be the only payment required at present from the purchaser; and that the calls hereafter to be made would not exceed 10s. per share, nor be called at less intervals than three months. The lots comprised not less than five nor more than 50 shares, and the prices realized were from 5s. to 10s. per share premium.

EXPLOSION AT THE RADFORD GAS-WORKS.—On Thursday morning last about six o'clock, an explosion occurred at the Nottingham Corporation Gas-Works, Radford, which, although of a very alarming nature, was happily unattended by loss of life. The scene of the explosion was the governor-room of the gas-works. It appears that an unusually strong back pressure in the Basford main caused the gas to escape rather too freely from the governor of this main. The consequence was that the room was soon filled with gas. About five minutes to six one of the workmen opened the door of the room, and the accumulated gas escaped, and, becoming ignited at a lamp in the passage, exploded with a terrific noise, which was heard over half a mile away, blowing the glass out of the windows of the room itself and of several houses in the immediate vicinity. The Manager (Mr. Tragg), who fortunately lives close by, hearing the noise of the explosion, hurried out, and, with great presence of mind, throwing a coat over his head, rushed into the governor-room, at great personal risk, and attempted to turn off the escape-valve of the Basford governor. Twice had he to come into the open air on account of suffocation before he accomplished this dangerous task. The Nottingham Fire Brigade were telegraphed for, but their services were not required. With the exception of one man, who got his hand slightly scorched, no personal injuries were inflicted.

PORTLAND CEMENT CONCRETE.—At the Meeting of the Liverpool Engineering Society on the 16th inst., Mr. Wilfred S. Boulton read a paper on "Portland Cement Concrete." After enumerating the advantages of employing concrete in place of brickwork or stone in certain positions, he said he considered a *prima facie* case made out in its favour, whenever there happened to be large spoil heaps of rock rubbish, or considerable deposits of shingle or gravel. For tide work he considered concrete blocks to have a decided advantage over its rivals, on account of the rapidity with which the blocks, when formed, could be set in place. From his own experience, Mr. Boulton said he had known of as many as forty-five 7-ton blocks being set in one tide by one setting gang with the aid of a steam jemmy. He considered that in order to get good concrete, great care should be taken to have a proper gradation in the sizes of the stones, or materials used as aggregates. When speaking of the strength of Portland cement, he mentioned that the specification of Mr. Deacon, Borough



Engineer, required 800 lbs., and that of Mr. Lyster, the Dock Engineer, 700 lbs. per 24-inch testing section. The paper was well illustrated by numerous diagrams and photographs of machinery employed in mixing concrete, and in constructing concrete works, which the author described in detail. After describing the construction of a concrete graving dock, 950 feet in length, with which he had been connected, and the machinery employed, he concluded by giving many statistics of the actual cost of concrete work. From these we gather that the cost of labour in making concrete blocks in large quantities amounts to only 2s. 7d. per cubic yard.

**LOCAL GOVERNMENT BOARD INQUIRIES.**—On the 11th inst., Mr. Arnold Taylor held an inquiry at Lichfield, in consequence of an application of the Corporation to borrow £10,000, for the purpose of enabling them to proceed with the sewerage scheme, which has been for some time on foot. Mr. Griffiths, the Engineer for the Works, laid before the Inspector an estimate of the amount which will probably be required to enable the Board to complete the work, including the outfall. This was fixed at £14,799, and the Inspector advised the Corporation to make application to the Local Government Board for sanction to borrow that amount, and this it was decided to do. The Inspector visited the outfall works, and afterwards intimated that he would make his report in the usual course.—On the 18th inst., Mr. Harrison held an inquiry at Buxton, relative to the application of the Local Board to amend the Town's Improvement Act, and to borrow further sums of money to carry on works now in progress and projected in the town. The first item considered was a further loan to complete new gas-works, which are calculated to cost £21,140, and will be capable of producing half a million feet of gas per day, whereas the works now existing only produced 90,000 feet per day. No opposition was offered, and the Inspector said the money was enough to construct works on the most approved system, and he hoped they would be able to make gas of a far better quality than they did at present.

**CO-OPERATIVE SANITATION.**—The ingenious Scots have hit upon a plan for cheapening the luxury of sound sanitary advice. Some of the leading noblemen and gentlemen in the neighbourhood of Edinburgh have been struck with the difficulty that at present hampers the householder in obtaining skilled opinions upon, and periodical inspection of, sanitary appliances in their dwellings. For one thing, it is extremely costly to fee experts, and then there is often suspicion that the cheap sanitary engineer is in league with patent-mongers or opulent plumbers, whose influence on his opinion is the reverse of wholesome. The only way of avoiding faithless counsellors is to consult a professional engineer of high scientific standing, whose fees are usually fixed at prohibitive rates. For want of any means of getting advice of this sort, houses get into an insanitary condition before the occupants are aware of the fact. Perhaps it is not till death has stricken his family that the householder becomes conscious of the unwholesomeness of his dwelling. To meet such cases, it is proposed by some of the most distinguished citizens of Edinburgh to apply the co-operative principle to scientific sanitary inspection. They are attempting to organize an association, the annual subscription to which will be one guinea, for the purpose of securing to its members, free of charge, that skilled sanitary supervision and advice which could only be got at enormous cost through individual action. The association is to secure the exclusive services of one or more well-educated young engineers, who, acting under the sober control of a consulting engineer of high standing, will, when required, inspect and report upon the dwellings of members, giving estimates as to the cost of any alterations that may be deemed advisable. Their recommendations must be limited to strictly indispensable points, and no officer of the association is to hold any pecuniary interest in any patent or manufacture. The Professor of Engineering in the University of Edinburgh has taken such a warm interest in this novel scheme, that he has offered for the first year to give the association his gratuitous services. Another feature of the scheme is that each member, on payment of a trifling fee, may secure the services of the officials for any charitable society whose work in individual cases might be aided by them, or for any person in whom they are interested, who, though deserving, is too poor to obtain for himself good sanitary advice. This association involves the novel application of a very old principle. It simply does for the sanitation of the houses of the middle classes what the medical club or sick society does for the personal sanitation of the artisan, who, if he were to act individually, could not afford to purchase the best medical advice. There is no reason why so sensible and beneficent an idea should not be successfully carried out in practice.—*Examiner.*

## Register of New Patents.

3227.—BALDWIN, T., Manchester, and BAILEY, W. H., Salford, "Improvements in pressure-gauges." Patent dated Aug. 16, 1876. These improvements consist in so combining a barometer, which indicates the pressure of the atmosphere, and a pressure-gauge to indicate the difference between the pressure of the atmosphere and the pressure of steam, or the other elastic fluid, in the vessel to the said pressure-gauge is attached. Such a vessel is the condenser or the exhaust passage of a condensing steam-engine, and for the purpose of ascertaining the pressure in such condenser or exhaust passage the instrument is more particularly intended to be used. A sliding scale, having the pressure in pounds per square inch, or in inches of mercury, or both, is so placed that its zero, or line of no pressure, may at any time be moved, so as to coincide or agree with the surface of the mercury, or with the index hand of the barometer, and so enable the absolute pressure in the condenser of a steam-engine to be read off at once by merely noting the position on the sliding scale of the surface of the mercury, or the position of the index hand of the pressure-gauge, which will show at once the absolute pressure of the fluid in the condenser, whatever the pressure of the atmosphere may be at any time. The zero line may also be ascertained and marked on an indicator diagram to show the true absolute pressure thereon, and the condenser tested at any time as to its proper working condition.

This absolute vacuum gauge may be made with the index hands concentric when the barometer and pressure-gauge are constructed in a similar manner to the aneroid or Bourdon, or other spring-gauge or barometer, and the sliding scale for showing the absolute pressure may be made to slide in the required curve for that purpose.

When glass tubes are used for the barometer and for the gauge, the sliding scale is by preference placed between the two tubes, so that the absolute pressure shown by the distance between the surfaces of the mercury in the two tubes may be more easily measured, and the absolute pressure in the condenser determined.

A light disc or curved arm, or ring, may be attached to the index hand of the barometer, with a scale upon it, the zero of which will always show the pressure of the atmosphere, and thus the scale will always be in the right position without sliding, so that the index hand of the gauge attached to the condenser will point to it, and at once indicate the absolute pressure in the condenser.

The scale for pressures and the sliding scale may, when required, if an aneroid or other spring-gauge or barometer is used, be made straight

instead of curved, by using any suitable gearing for the purpose, such, for example, as a light rack and pinion, or any suitable combination of link work.

3231.—PEEBLES, D. B., Edinburgh, "Improvements in apparatus for governing or regulating and adjusting, or otherwise acting on the flow or pressure of illuminating gas, a part of the said improvements being also applicable to two-way or multiple-way valves for other fluids." Patent dated Aug. 16, 1876.

This invention comprises various improvements in details specially designed for the transmission and application of illuminating gas, but a part of the improvements is also advantageously applicable to two-way or multiple-way valves for other fluids.

In one improved arrangement a light electric current can be used for regulating or varying the action of governors at a greater or less distance; and this arrangement is especially suited for governor arrangements of the kind described in the specification of letters patent obtained by the present inventor, and dated June 26, 1875 (No. 2328), in which arrangements a large governor is controlled by means of a comparatively very small governor. A separate weight is applied to the diaphragm, disc, or bell of the small governor, apart from which separate weight the governor is adjusted to allow a certain small flow of gas to pass, either barely sufficient to keep the burners alight, or as much more as the circumstances of each case may require. The separate weight is such as to give a maximum flow or full pressure, and it is connected to a lever which is fitted with an armature in a position to be acted on by a small electro-magnet. When the electric circuit is closed, the magnet causes the lever to lower the weight upon the governor, diaphragm, disc, or bell, but the weight is suspended to the lever by a loose link, so that only the pressure of the weight acts on the governor. When the circuit is broken, the lever being counterbalanced, or acted on by a spring, lifts up the weight. The improved apparatus is applicable to other governor arrangements besides that referred to. Thus the street-lamps of a district, or the burners of a theatre, railway station, factory, or other large establishment, may be controlled by its means. It can also be used in combination with clock-work or other mechanism for giving flashing or intermittent lights from lighthouses or signal stations, the gas being economized and saved between the flashes instead of being wasted whilst hid by shutters.

A second part of the invention relates to the inlet valves by which the gas enters the governor apparatus; and in carrying it out two diametrically opposite apertures for the gas are made in the sides of a vertical inlet-pipe, the top of which is closed. The apertures are more or less closed by conical or conoidal valves formed on the ends of two tubes, which are screwed internally, and are upon screwed spindles, which spindles or tubes are adjustable in position, and are connected to the diaphragm, disc, or bell, so as to screw the valves in or out as required.

A third part of the invention consists in forming an improved gas-torch or lamplighter, by combining a small governor of the kind described in the specification of other letters patent obtained by the present inventor, and dated Sept. 16, 1871 (No. 2446), but loaded by a spring rather than a weight, with a cylindrical or other suitably shaped vessel to receive gas, compressed so as to constitute a sufficient supply. The vessel with the governor has attached to it a tube of sufficient length, with a burner at its upper end, the flame being shielded in the usual way if required.

A fourth part of the invention relates to an improved burner for a single gas-jet, in which a tip of steatite or other similar substance is fixed in the outer end of a shell of brass or other suitable metal, the shell being turned in and milled over the shoulder of the tip, or into a groove or grooves formed in the tip. The milling makes the burner more ornamental, and facilitates the proper fixing of it in the socket or branch-pipe end. The inner end of the shell is closed by a small block of soft metal, through which a small hole is drilled, thus making in a simpler and better manner than heretofore a class of burner which is, to a certain extent, self-regulating.

A fifth part of the invention relates to burners of the kind known as Bunsen burners, and comprises simple arrangements whereby the supplies of gas and air are simultaneously reduced or increased by one movement. In one modification a conical socket is formed in the base of the burner, and the gas inlet leads to the side of this cavity. A conical plug fitting the cavity is formed on or fixed to the main burner tube, and a way through one side and up the centre of this plug admits the gas from the inlet when the plug is in the proper position. A shell encircles the lower part of the burner-tube, and air-holes are made through it and through the tube. The shell is ordinarily a fixture, but is adjustable, and when the burner-tube is turned it closes or opens both the gas and air inlets. In another of the modifications an externally screwed nipple projects up in the centre of the base, the gas issuing up from a central aperture in the nipple. The aperture is controlled by a conical valve formed on or attached to a piece which is fixed to the burner tube, and screws upon the nipple, so that by turning the tube the gas aperture is more or less closed, the same movement acting on the air inlets as in the first modification. In a third modification the outer shell of the burner is extended to the top of the inner tube, and is closed over it. The tops or upper parts of the tube and shell are formed with holes for the issue of the mixed air and gas, and the turning of the tube (which may be done by means of a lever projecting through a slot in the shell), alters the outlet area as well as the inlets for gas and air. In all the modifications a series of the burners may be arranged so as by levers, connected all to a single rod or otherwise, to be simultaneously adjusted.

A sixth part of the invention relates to a two-way or multiple-way valve or cock suitable for any fluid, but specially designed to admit of the extreme tightness of fitting desirable in the case of illuminating gas, particularly with large valves, without attendant inconveniences. In carrying out this improvement a conical plug is employed, but instead of this plug being held in its conical casing or socket in the ordinary way, it is held by a spindle passing completely through the axis of the plug, and formed with two screw-threads of different pitches, one on the bottom end screwing into the bottom of the socket, and the other screwing into the plug. The spindle can be turned by a separate handle or key from that for turning the plug, and serves, by the powerful differential action of the two screws, for tightening the plug in its socket when adjusted, or for slightly loosening it when it requires to be adjusted.

3319.—DUCKETT, J. P., Rotherham, "An improved cistern and self-acting water-waste preventer." Patent dated Aug. 24, 1876.

This invention has for its object the so regulating the supply of water to baths, water-closets, and such like purposes as to prevent or materially reduce the waste of water, and consists of a cistern of a peculiar shape, supported or suspended on standards or a frame by pivots, on which it is free to rock or oscillate, and the shape of the cistern is such that when full the greater weight of water at the larger end of the cistern presses down that end. At the larger end of the cistern is placed the supply-pipe fitted with a tap, and when the cistern is full of water a projection or angular piece fitted to the larger end of the cistern presses on the top of the supply-pipe so as to close it. In the bottom of the cistern is fitted the outlet-valve, which, when water is wanted to flow from the cistern, is lifted off its seating by means of a lever, which is so arranged that when it is



acting to keep open the outlet valve it is also acting on the larger end of the cistern, so as to keep the projection or angular piece pressing on the tap on the supply-pipe, but as soon as enough water has been drawn from the cistern, and the outlet-valve is allowed to close, the action of the lever upon the larger end of the cistern, and consequently on the projection or angular piece, is removed, and the cistern is allowed to oscillate on the pivots, so as to open the tap on the supply-pipe, whereby the water from the supply-pipe is allowed to flow into the cistern until the cistern is again sufficiently filled, when the larger end of the cistern is pressed down by the weight of water at that end, and causes the projection or angular piece to press upon and close the tap of the supply-pipe.

3365.—FROST, J., Huddersfield, "*Improvements in purifying sewage and foul water, and in treating water for boiler purposes.*" Patent dated Aug. 26, 1876.

In carrying out this invention it is proposed to employ the following ingredients—viz., the sulphide and hydrates of barium; hydrates of iron; and the precipitated hydrates, sulphides, and sulphides of the same metal; the sulphides of soda, slaked lime, carbonate of lime, and sulphuric acid. These may be employed either separately or in a variety of combinations, according to the character of the sewage or water under treatment.

3370.—REDFERN, G. F., South Street, Finsbury, "*Improvements in gas motor engines, and in apparatus connected therewith.*" Patent dated Aug. 28, 1876.

The principal improvements consist in the construction of a stationary engine as follows:—

A cylinder of suitable construction is provided with a differential piston. The explosion chamber is placed at the side of the cylinder, and is provided with a slide-valve for admitting, at each revolution of the driving-shaft, the required quantity of the explosive mixture, which being inflamed enters the cylinder below the piston, acting on the smaller surface thereof; and before the piston arrives at its highest point a valve-cock allows the mixture to enter above the piston and act on its larger surface. When the piston has completed its stroke, the valve-cock, operated by a link motion, allows the escape of the gases. The cylinder and explosion chamber are surrounded by water, and an arrangement is provided for lubricating the piston with distilled water, as also the stuffing-box. The piston-rod is connected to the crank in the usual manner, and the driving shafts are made hollow, so that they may serve as reservoirs for oil. The valve-cock is operated from a grooved disc on the crank-shaft moving a lever enclosed within a casing to keep it from the water, but the water circulates through the hollow valve-cock. The slide-valve is operated by a tapped disc having a steel tappet, on which slides a pulley on the forked end of a rod, a spiral spring serving to bring the slide back to its normal position after it has been raised. On the top of the slide-valve is a pipe coming from the compressor, and provided with a suitable valve, and a governor for regulating the action of the throttle-valve. The compressor is in direct communication with the air-pump, which is double acting, and is operated by gearing. The pump sucks in air and gas, and thoroughly mixes and forces them in a condensed state into the compressor.

The gas for working the improved machine is produced as follows:—The hot air from the cylinder is caused to pass into a casing, enclosing the gas generator, consisting of a metal chamber having a square rod carrying a number of plates, on to which gasoline, petroleum, kerosene, or other heavy oil is conducted by a copper pipe. The raising of the plates causes the oil to flow downwards, and the heated gases surrounding the whole convert the oil into gas, which collects in the upper part of the chamber, and is conveyed by means of a pipe to the air-pump; the tar formed being collected in a suitable box. Pipes are provided for assisting to cool the water surrounding the working cylinder. For engines of 20-horse power and upwards the gas is produced in a separate apparatus.

The mixture of air and gas is ignited by a galvanic battery and inductor, the spark being produced by a pin on the crank-shaft, which comes into contact with a lever so as to close the circuit at the moment required.

3371.—BER, O., Paris, "*An improved automatical apparatus for shutting cocks of gas, steam, water, or other fluids or liquids.*" Provisional protection only obtained. Dated Aug. 28, 1876.

This invention relates to apparatus for automatically shutting cocks at a determined time, such as the cocks of gas-pipes, steam, or water pipes. For this purpose there is mounted, beside the cock to be operated on, an axis, having an arm connected to, or arranged to bear against, the lever handle of the cock, and also on the opposite side of the axis an arm loaded with a weight, which, so long as it is not counterpoised, keeps the cock open. A receptacle for sand is provided, and mounted on arms projecting from the axis, which receptacle is gradually filled from a similar receptacle above, provided with a regulating sluice. When sufficient sand has run into the lower receptacle to overbalance the weight, the axis is caused to turn partly round, and its arm acting on the cock-handle, causes the cock to be closed. In order to regulate the time during which the cock has to remain open, the weight rests upon an adjusting screw, or is slid along the arm and set farther from, or nearer to, the axis, so that it will require more or less sand to flow into the lower receptacle in order to overbalance it.

3376.—SIEB, P., and SCHWARZ, T., Hamburg, "*Improvements in gas regulating and saving apparatus.*" Patent dated Aug. 28, 1876.

This apparatus consists of a metal case, preferably of a spherical form. In about the middle of this case an air-tight partition made of flexible material (either prepared leather or other suitable substance) divides the case into two compartments. At the lower end of the spherical case a metal tube is connected to it at right angles. This tube is likewise divided into two compartments by a horizontal partition made of sheet metal, of which the lower one is connected to the inlet-pipe of the gas. The gas passes from this compartment through a valve into the under partition of the spherical case, from which it escapes through an opening into the upper division of the metal tube leading to the gas-pipes and burners. The pressure of the gas in the spherical case is regulated by the lifting or lowering of the flexible partition, and as this partition is in connection with the gas admission valve, the opening of it is either diminished or enlarged when the pressure either rises above or falls below its normal state. From the top of the spherical case the resistance of the flexible partition can be regulated by means of weights, which can be placed on the upper surface of the same. In this manner the pressure of the gas is regulated within the spherical case, and in consequence a uniform flow of gas through the outlet-pipe is attained, and considerable saving of gas at the burners effected.

3410.—CHATWIN, J., Birmingham, "*Certain improvements in the manufacture of gas-burners, as also the parts for receiving and sustaining shades for the same.*" Provisional protection only obtained. Dated Aug. 30, 1876.

From the chimney gallery of an ordinary Argand burner is supported a vertical, square, or other irregular shaped wire, covered with thin round brass tubing, this gallery having projections for supporting a small annular glass reflector. On the top of the square or other shaped wire, and resting

on its tubular casing, a ring is applied centrally over the burner below, a vertical socket being secured to the ring for that purpose. The ring is provided not only with vertical wires for steadying the chimney, but also lateral projections for supporting an opal or other suitable reflector above the light.

3422.—M'MANUS, H., New York, "*Improvements in gas-governors.*" Provisional protection only obtained. Dated Aug. 30, 1876.

This invention relates, first, to that class of gas-governors in which the movement of a flexible diaphragm is caused to regulate the size of the opening through which the gas flows, and it consists in constructing the different parts of the governor in such a manner as to ensure greater sensitiveness and accuracy, to facilitate adjustment to suit different pressures, to render the apparatus more durable, and to adapt it for attachment to inlet-pipes and outlet-pipes occupying different positions. A further object of this part of the invention is to facilitate the manufacture of the governor, and to prevent the apparatus from being tampered with. In carrying out this part of the invention the outer casing is constructed in two sections, an upper and a lower, the latter of which is made of a tubular form at the lower part, where it is provided with three threaded ways or branches, arranged two horizontally and the third at right angles to the other two, and this lower section is also expanded in diameter at the top to form with the upper section a shallow chamber divided horizontally by a flexible diaphragm, the edge of which is clamped between flanges formed on the two sections.

The invention relates, secondly, to apparatus applicable more particularly to gas-burners, and is for the purpose of regulating the passage of the gas. In carrying out this part of the invention, a chamber is provided between the regulating cock and the burner, the bottom of which chamber is by preference made slightly concave or dish-shaped, and has formed through it a small orifice for the passage of the gas to the burner. In this chamber there is placed a loosely-fitting thin disc of mica, gelatine, isinglass, porcelain, flexible glass, or other suitable flexible incorrodible material, which covers the gas passage, and rests at its periphery only upon the bottom of the chamber, webs or projections being provided in the upper part of the chamber, in order to maintain the disc in its proper position.

3443.—MORGAN-BROWN, W., Southampton Buildings, London, "*A new or an improved hydro-pneumatic pump.*" Patent dated Sept. 1, 1876. The object of this invention is to produce a new description of pump for raising water or other liquids economically and rapidly, both as regards the cost of the apparatus and its industrial results, whilst at the same time it is easily driven or manipulated. Its action is dependent essentially on the consumption of gas mixed in such proportions with air as to produce an explosive mixture as an economical and certain means of producing a vacuum in an appropriate vessel, and on the utilization of such vacuum to raise water to different heights, and in subsequently discharging it for different industrial purposes.

The patentee claims "The utilization of the explosion and expansion of hydrogen gas, whether applicable for lighting purposes or not, proportionally and homogeneously mixed in a closed vessel with atmospheric air (as well as any other gas or explosive mixture) to produce a vacuum in the vessel itself, and the utilization of the consequent instantaneous action to the raising of water or other liquids to definite levels, according to circumstances and the requirements of those who apply the system, in order to consequently discharge this raised water in canals or on soil to be irrigated, or for otherwise making use of its fall as a motive power, acting, therefore, as the case may be, sometimes as a simple suction-pump, and at the same time as a motive power, and at other times merely as a motive power, but always automatically, without opposing resistance to the free expansion of the gases in their explosion, and producing very considerable power with a comparatively very small expenditure or expense, either as regards first cost of this machinery or that of its working, for the purposes and in the manner above described."

#### APPLICATIONS FOR LETTERS PATENT.

- 161.—JORDAN, C., Newport, Monmouth, "*Improvements in joints for connecting pipes or tubes for gas, water, or other purposes.*" Jan. 12, 1878.
- 172.—ALEXANDER, J., Lanark, N.B., "*Improvements in engines for compressing air or gas.*" Jan. 14, 1878.
- 173.—HUNT, B., Lincoln's Inn, London, "*Improvements in the process of and apparatus for superheating steam, and making, heating, and illuminating gas.*" A communication. (Complete specification.) Jan. 14, 1878.
- 188.—MELDRUM, R., Edinburgh, "*Improvements in drawing off liquids, and preventing the reflux of same or of gases through pipes, and in the construction of automatic traps or valves and fittings connected therewith.*" Jan. 15, 1878.
- 195.—ATKINS, F. H., Fleet Street, London, "*Improvements in preparing materials for filtering water and other fluids.*" Jan. 15, 1878.
- 202.—OKES, J. C. R., Marylebone, and ROBINSON, H., Westminster, "*Improvements in filter presses.*" Jan. 16, 1878.
- 216.—WRIGHT, F., Westminster, "*An improved governor for gas-burners.*" Jan. 17, 1878.
- 219.—GRADDON, J., Clapham, London, "*Improvements in machinery for pumping or forcing fluids for motive power or other purposes.*" Jan. 17, 1878.
- 228.—RAMSBOTTOM, J., Leeds, Yorks, "*Improvements in engines for obtaining motive power from liquid and gaseous fluids, and for pumping and compressing.*" Jan. 17, 1878.
- 230.—WALLACE, R. W., Mark Lane, and CHRISTOPHER, G., Clapham, London, "*Improvements in the purification of gas, and the production of bye-products therefrom.*" Jan. 17, 1878.

#### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 2749.—SMON, L., Nottingham, "*Improvements connected with atmospheric gas-engines.*" July 18, 1877.
- 2757.—CRAIG, W., New Cross, London, "*Improvements in direct-acting steam-pumps.*" July 19, 1877.
- 2843.—LAKE, W. R., Southampton Buildings, London, "*Improvements in water-meters.*" A communication. July 25, 1877.
- 4077.—FOULIS, W., Glasgow, "*An improved 'dip-pipe' for gas-works.*" Nov. 2, 1877.
- 4297.—TYLOR, J. J. and W. A., Newgate Street, London, "*Improvements in apparatus and arrangements for regulating, controlling, and arresting the flow of liquids and fluids.*" Nov. 16, 1877.

#### PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

- 66.—KIDD, J., "*Improvements in the manufacture of gas for lighting and heating purposes, and in the apparatus connected therewith.*" Partly a communication. Jan. 7, 1875.
- 101.—FYFE, D. A., and BOWERS, W. H., "*Improvements in the method of and apparatus for producing gas or gases for heating and for illuminating purposes.*" Jan. 12, 1875.



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THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 29, 1878.

Circular to Gas Companies.

THE thirty-seven Gas Bills to be presented to Parliament in the present Session offer but few points of interest. No important contest is to be anticipated, inasmuch as the cases which will provoke disputes are of no great consequence. The Bills of the Bangor Corporation and of the Bangor Water and Gas Company will, as a matter of course, give rise to a fierce struggle in Committee; but it will be a mere storm in a teacup. Welshmen are, however, obstinate and litigious, and we anticipate that the matter will be fought out to the bitter end. The Corporation have little to gain by the purchase, and the Company have nothing to lose, if they can secure good terms on arbitration. We need not tell the Company the terms to which they may agree. Our columns record, as fully as we can obtain the information, all the sales effected. Twenty-five years purchase of

statutory dividends, in the absence of proved *laches* on the part of the Company, is the acknowledged value of a statutory undertaking. Such a price the Bangor Company may accept, for it is the same as would probably be fixed on arbitration; and the expense and trouble of a reference may well be saved. The preamble of the Newry Compulsory Purchase Bill makes grave accusations against the Gas Company, which, if they be fully established, will probably lead to the triumph of the Town Commissioners. As yet, however, no case for the Company has been presented to us, and the defence they will offer may be conclusive in their favour. We hope it may be so, for it is with extreme regret that we see a Gas Company failing to do their duty to the public.

There are several competing Bills this Session, a number of Companies and Local Authorities being anxious to have, or to share, the honour of supplying larger or smaller districts in Yorkshire. We do not envy the Parliamentary Committees, who will have to decide between the conflicting claims of the several applicants for statutory authority. We are sorry that matters cannot be arranged between the Companies, so that a contest may be saved; but there are so many people interested in a parliamentary fight, that everything is done to stimulate and promote a struggle of that kind. Fancy the glorious holiday some of the Newry Commissioners, with their Clerk and Solicitor, will have in London presently. A fortnight at the Westminster Palace Hotel, or Morley's, at the expense of ratepayers, will greatly exhilarate their spirits, which may, however, be damped by the non-success of their Compulsory Purchase Bill. In any case, they will go back to Newry with their fingers to their noses, and laugh at the dupes of ratepayers, whose gas bills will be none the less, and whose houses will be none the more brilliantly illuminated, if the Commissioners succeed in their objectionable project.

Up to the present time there have been few failures upon Standing Orders in either House, and we may conclude that most of the Bills promoted will go forward. We have not, as yet, remarked any failure in a Gas Bill; but, hitherto, all that have been promoted have not passed the Examiners, and had a first reading.

The gas agitation still continues at Hastings, and floods of nonsense were emitted at a public meeting held there last week. Undoubtedly, gas is somewhat dear there; but there are circumstances which completely justify the price. If the Town Council should, by any accident, get possession of the undertaking, they would be compelled to maintain the same charge for many years, and probably find it necessary to increase it. The idea of starting a competing Company, which some gentleman in Hastings entertained, is perfectly absurd. Parliament never sanctions competing Companies. In like manner the Town Council will find it impossible to set up an undertaking in competition with the Gas Company. They may, no doubt, buy the Company, if they will pay a fair price to them; but we do not see that the town and ratepayers will be in the least benefited. The dream of making large profits for public improvements is utterly delusive. Manchester, it is true, makes large profits; but it is only because the price of gas is half as much again as it need be. The gas consumers of Manchester have been taxed for the greater part of the public improvements made in that City during the last thirty years, and if the Consumers of Hastings are desirous of contributing to public improvements, let them urge on the Council in making a compulsory purchase of the Company's undertaking; but let them understand that the supply of gas by a Local Board is only one form of indirect taxation.

The formal transfer of the Ramsgate Gas and Water Works to the Local Board was completed on the 23rd inst., when the seal of the Board was duly fixed to an agreement for the loan of £155,000 from the Bank of England. The consideration paid for the gas undertaking is £70,052 12s., and for the water £70,436 18s. 7d. The 23rd was a great day for the Rev. E. Gripper Banks, who, after the proceedings, went home with an ill-concealed sense of triumph. He may, however, remember the motto, "*Finis coronat opus.*" He has now to make the works pay, and satisfy the Ratepayers of Ramsgate that his calculations were correct, and his deductions safe. If the Local Board can only make the most seedy-looking of our southern watering-places, commonly misnamed "health resorts," a little brilliant of an evening, our next visit to the place will be more agreeable.

At Colchester an agitation is growing up—and we never remember when there was not a discontent at Colchester. Very disinterested people are now endeavouring to incite the Town Council to take over the gas undertaking, and work it for the improvement and ornamentation of the town. We doubt



whether anything could beautify Colchester, but it certainly may be improved.

The British workman—we speak of him, of course, as a class—is becoming everywhere a serious sort of embarrassment. He is exacting, he is improvident, and he is lazy. He has just given the Weymouth Gas Company a taste of his qualities. The stokers, earning twenty-four shillings a week, asked for a considerable advance, and, it not being convenient to pay it, they gave notice, and at the end of a week left their work. In South Wales a large number of men are in idleness on account of their own folly, and their families are said to be in great distress. To Rhymney, then, the Weymouth Manager resorted for the labour he needed. Men came, went to work for two hours, then left their work, and demanded money to take them back again to Wales, which they did not get. They seem to have stayed in Weymouth some days, enjoying the beautiful scenery in the neighbourhood, supported, we presume, by the men on strike. There was, for a day or two, a fear that Weymouth would be left almost in darkness; but the energetic Manager soon collected a competent gang of stokers, and all risk was at an end. We sincerely hope the mania for striking will not spread among gas employes.

The merits of lighting by electricity, as compared with gas, have been discussed by the Members of the Institution of Civil Engineers. It must be admitted that, for lighting large areas, with few obstructions to the passage of light, electricity possesses many advantages. The light given is brilliant, and the cost low. But, as was very properly said at the Institution, when we come to lighting small separate apartments or shops, the advantage of gas is predominant, and will remain so until some means of minutely subdividing the current is discovered. We imagine that the day is distant when the announcement of such a discovery will be made. Impossibility is a word which cannot be employed in relation to any scientific object. If it could, we should be inclined to say that the minute subdivision of one electric current was an impossibility.

Dr. C. W. Siemens lectured on the same subject before the Society of Telegraphic Engineers. He is, perhaps, the most eminent practical electrician of the day, and his opinions have great weight. His machine and light are the most perfect at present in use, and we may look to him to take the lead in the development of the electric light. On the whole, Dr. Siemens agrees with the speaker quoted above, as to the difficulty of subdividing the current, and cheaply distributing the electricity to produce light. He says, "The complete realization of all the advantages of the electric light remains, however, a problem to be solved, and it would be extravagant to expect, from applications on a small scale such as have hitherto been made, anything like the amount of relative advantage indicated by theory." In the meantime, the Money Market shows that a sagacious public maintain a firm belief in the stability of gas shares, which have now almost returned to what we may call their normal prices; and, everything going well, gas property will probably increase in value during the year.

Mr. Travers has once more, in a neat little pamphlet, called attention to the use of gas for heating and cooking purposes. He further suggests, in a letter which we publish elsewhere, the advisability of having an exhibition of useful apparatus for heating and cooking purposes at the coming meeting of the British Association of Gas Managers. We have a fear that Managers and Directors are not yet awake to the advantages they might derive from a large summer sale of gas, which can only be promoted by the extended use of gas for culinary purposes. If this could be effected, every bench of retorts might be at work all the year round, except so far as repairs and re-settings would be required. Stokers would be more satisfied; Managers, we think, would not be overworked; and Shareholders, we believe, would profit. London, we think, is not the place in which an exhibition is most needed. A stroller down the Strand has only to make use of his eyes. On the right-hand side of the way, from the Adelphi to where once stood Temple Bar, he will see several shops in which he will find displayed the best and most useful gas apparatus for heating and cooking purposes.

We publish to-day an ingenious plan, devised by Mr. W. C. Young, for the indirect determination of the amount of sulphur in coal gas. The process is as simple as it is ingenious; and we agree with Mr. Young in thinking that very accurate results may be obtained from its use in the hands of any one, not a skilled chemist, who will take a little pains.

Referring to some remarks in a recent "Circular," we observe that the Ipswich Gas Company deny that their gas is ever below the parliamentary standard; and, indeed, the returns of the Examiner himself show that the gas is, as a rule, very considerably above it. There seems some dispute as to the custody

of the apparatus at the Town Hall. The Examiner and an Officer of the Gas Company should have equally free access to the room in which it is kept, and an Officer of the Company may always be present when the Examiner of the Town Council tests. The last return of the Examiner conclusively proves the Company to more than fulfil their duty to the public.

### Water and Sanitary Notes.

THERE can be little doubt that the new scheme of water supply proposed by Messrs. Bazalgette, Bramwell, and Easton has no chance of success in the House of Commons. It is everywhere rejected in the Metropolis, and the best thing the Metropolitan Board could do would be to withdraw the Bill. At a meeting of Vestry Delegates (outside the Board), the new scheme was unanimously condemned by the speakers. The "Supply Bill," as it is called, has been sent to the several Vestries, and in a fortnight's time we shall get the opinion of the whole bodies, and not merely that of their delegates.

It is premature to speculate on the chances of the Purchase Bill. It must be admitted that this measure obtains a considerable amount of support. There is, however, even among our Local Authorities and among the general public, a strong suspicion that, however desirable it may be to abolish Water Companies, the Metropolitan Board, as at present constituted, is not the body to whom the water supply should be entrusted. Our wonder is that the Board should desire to be burdened with the management of these undertakings. The labour it would impose would be overwhelming. Nothing less would be required than the appointment of several small Committees to take the place of the Directors of the several Companies, and then a General Committee to govern the whole. Some people read, perhaps, in the papers, of the Water Committees of the Corporations of Manchester and Liverpool, and of the extensive works they manage; and of the grand schemes they indulge in, and they may imagine that the management of a water undertaking is a very simple matter. But the undertakings of Liverpool and Manchester shrink into insignificance when compared with those of the Metropolis; and the labour required for their management is as nothing compared with that which would be necessary to superintend the supply of upward of four millions of people. We are afraid the Board have not sufficiently considered the matter from this point of view. There are those, of course, who would undertake anything, and it has passed into a proverb that such men never do work well. We fear very much, then, that the management of the water supply by the Metropolitan Board would be a miserable failure, even if backed by the best professional assistance. With ignorant or dishonest advisers, there is no knowing what might happen.

The Water Purchase Bill of the Metropolitan Board of Works is naturally a very simple measure. It is to give the Board power to acquire the undertakings of the several Companies on giving notice within three years of the passing of the Act. It is to empower the Board to appoint a Committee for the management of the undertakings when they have been acquired, and to authorize the Board to borrow any amount of money to complete the purchase. A cash transaction is not, however, contemplated. It is proposed to create "Metropolitan Consolidated Water Stock" equal to the amount of the purchase-money, which is to be paid off within one hundred years.

The Metropolis Water Supply Bill, which is to authorize the new scheme, is necessarily of a more complicated character. It seems that after all it is proposed to make the receipt of the new supply optional to existing owners.

A contemporary has made a suggestion that the Metropolitan Board of Works should now confine their Purchase Bill to an attempt to acquire the three Companies south of the river. If purchase can be justified, it might be well for the Board "to try their prentice hands" on managing an undertaking on a comparatively limited scale; but the opportunity, we expect, will not be vouchsafed. The Water Companies must be transferred as a whole, or not at all. An idea appears to prevail that, because the Southwark and Vauxhall Company are just now under a cloud, they may be bought up at a low price. Twenty years purchase, at five per cent., is suggested; we may inform the enterprising speculators, however, that Parliament never allows the confiscation of a Company in temporary difficulties. The Southwark and Vauxhall Company will soon again be in a prosperous condition, and their water will, in respect of purity, be equal to any supplied from the Thames. Under these circumstances, a bargain is not to be expected.

The Corporation of Manchester have taken alarm at the motion of which Mr. E. Howard has given notice, and a deputation



from the Town Council have waited upon the President of the Local Government Board, and implored the assistance of the Government to prevent the motion from being carried. They also asked Government assistance in carrying the second reading of their Thirlmere Bill. Mr. Howard's motion has not exactly the aspect of hostility to the Manchester scheme, and we scarcely see how the scheme would be prejudiced if the motion were carried. The broad question which Mr. Howard wishes to raise before a Select Committee must some day be discussed.

#### GAS BILLS FOR 1878.

TEN Bills are promoted for the incorporation of Companies, some new, but for the most part those which have hitherto carried on their business as Limited Undertakings or under Deeds of Settlement.

The *Brading Harbour Gas Bill* is to incorporate a Company to supply such parts of the parishes of Brading and Saint Helen's, Isle of Wight, as are outside the limits of the Ryde Gas Act. The capital of the Company is to be £20,000, in £10 shares. Power is asked to borrow to the usual extent of one-fourth of the capital, the interest being limited to five per cent. It is proposed to supply gas of fourteen-candle power, at a price not exceeding 6s. per thousand. This being a new Company, they do not propose to adopt the sliding scale and auction clauses.

The *Castleford and Whitwood Gas Bill* is to dissolve and re-incorporate the Castleford and Whitwood Gas Company, Limited, with extended powers. The present capital of the Company is £30,000, of which £20,300 has been paid up. Power is sought to raise additional capital to the extent of £30,000, which sum is to include the premiums realized by the sale of shares by auction. The standard rate of dividend on the old and new capital is ten per cent., subject to the sliding scale. Borrowing power to the usual extent is asked. It is proposed to supply gas of fourteen-candle power, at an initial price of 4s. 7d.

The *East Grinstead Gas and Water Bill* is to dissolve and re-incorporate a Company who, under a deed of settlement, have carried on the business of a Gas Company since 1855. It is proposed to convert the original share capital into stock, which to be called Capital A; the new issue of £5000, in £10 shares, to be called Capital B. There is a provision in the Bill for the ridiculous division of shares into preferred and deferred half shares. Borrowing powers to the usual extent are asked. Gas of fourteen-candle power is to be supplied, at a maximum price of 6s. per thousand feet within a radius of one mile, and 7s. beyond. The sliding scale is not proposed, but the dividends on the two classes of capital are limited as usual. The new shares are to be sold by auction or tender.

The *Hemel Hempsted District Gas Bill* is to dissolve and re-incorporate the Hemel Hempsted and Boxmoor Gas Company, and another Company supplying parts of the same district, and to amalgamate the two. The original capital of the conjoined undertakings is £17,500, nearly all of which is paid up. This Bill seeks power to raise additional capital to the amount of £20,000, with borrowing powers to the usual extent on both original and new capital. Subject to the sliding scale, the standard dividends on the old and new capital are to be respectively ten and seven per cent. Gas of fourteen-candle power is to be supplied, at the initial price of 5s. 5d., 6s., and 6s. 8d., according to the distance from the works. The new shares are, of course, to be offered by auction or tender, and the full amount of the nominal value of such share, together with the premium offered, must be paid within three months of the date of sale.

The *Lea Bridge District Gas Bill* is to dissolve and re-incorporate the Lea Bridge District Gas Company. The original capital of the Company is £50,000, of which £35,000 has been paid up; and the Company have borrowed on debenture bonds £7000. This Bill seeks power to raise additional capital to the extent of £65,000, which, with the £35,000 already paid up, will make the capital £100,000. Borrowing powers to the usual extent are sought. The standard dividend proposed is ten per cent., subject, of course, to the sliding scale. New shares are, equally as a matter of course, to be offered to the public by auction or tender. It is proposed to supply fourteen-candle gas, at the initial price of 5s. 6d. per thousand.

The *Lewes Gas Bill* is to dissolve and re-incorporate the Lewes Gas Company, formed in 1822, and hitherto carried on under a Deed of Settlement. The present capital of the Company is £26,880, fully paid up. By this Bill, power is sought to raise additional capital to the extent of £25,000. As the Company have no mortgage debt, power is sought to borrow on both old and new capital, and the dividend on the new capital is limited as usual. Gas of fourteen-candle power is to be supplied, at a maximum price of 6s. within the parliamentary boundaries, and

7s. beyond such limits. The sliding scale is not proposed, but the new shares are to be sold by auction or tender, as usual.

The *Lichfield Gas Bill* is to dissolve and re-incorporate the Lichfield Gas Company. The original capital of the Company was £10,000; but it is alleged in the preamble that money has been expended out of profits, which has raised the value of the undertaking to £19,000. The original capital and expended profits, it is proposed to convert into stock, and then to raise £6000, to be added to old capital, making together the original capital £25,000. The Bill further seeks authority to raise additional capital to the amount of £25,000. Borrowing powers to the usual extent are sought, both on the old and new capital. Subject to the sliding scale, the standard price of gas, which is to have an illuminating power of fourteen candles, is to be 5s. 6d. per thousand within a mile and a half of the Guildhall, and 6s. 6d. per thousand beyond that radius. The new shares are, of course, to be sold by auction or tender.

The *Marske and Saltburn Gas Bill* is to incorporate a new Company to take over the gas undertaking of the North-Eastern Railway, which has hitherto supplied a portion of the district; and also to unite with the Redcar and Coatham Gas Company, after which the combined Company shall be known as the Redcar, Coatham, Marske, and Saltburn Gas Company. The capital proposed is £40,000, carrying the usual borrowing powers. The consideration for the Marske works of the North-Eastern Railway is £8000, of which £1600 is already paid. The capital asked for by this Bill is in addition to that of the Redcar Company, and the Company promoting it will individually disappear. The Bill proposes to supply fourteen-candle gas, at a maximum price of 5s. per thousand cubic feet. It possesses some curious features, which, perhaps, may be explained when it comes before a Select Committee.

The *Normanton Gas Bill* is to dissolve and re-incorporate a Company, originally started to supply gas and water, but as they have never had a water undertaking, they, in this Bill, only ask for powers to supply gas. The original capital of the Company was £20,000, of which £18,000 has been paid up. Power is now sought to raise £45,000 additional capital, the dividends on which, subject to the sliding scale, are limited to the now usual rates. Borrowing power to the usual extent, on both old and new capital, is asked. The Bill proposes to supply fourteen-candle gas, at a standard price of 6s. per thousand cubic feet. The new capital is, of course, to be offered to the public by auction or tender.

The *Tredegar Water and Gas Bill* is to incorporate a Company, with power to work separately the water and gas undertakings of the Tredegar Iron and Coal Company, Limited. The capital at present engaged in these undertakings is £30,000. Power is sought to raise £30,000 additional capital, with the usual borrowing powers. The dividend on the new capital is limited to the usual extent, and gas having the illuminating power of fourteen candles is to be supplied, at a price not to exceed 6s. per thousand cubic feet. As this is virtually a new Company, auction clauses and the sliding scale are not introduced into the Bill.

The Gas-Works Clauses Act of 1871 is, of course, incorporated in all the above measures. Testing-places are to be established, and the standard burner in every case is to be Sugg's new "London," No. 1. In all cases, too, it is provided that interest shall be paid on money deposited by way of security.

Ten Bills are promoted to obtain further powers for Gas Companies already incorporated.

The *Bangor Water and Gas Bill* is to enable the Bangor Water and Gas Company to raise additional capital to the amount of £20,000, carrying the usual borrowing powers. The new shares are, of course, to be offered by auction or tender, and the full nominal value of the share, together with the premium, is to be paid within three months of the sale. The dividend on the new capital is limited to seven or six per cent., according as it is raised by ordinary or preference shares. Gas of fourteen-candle power is to be supplied, at, we presume, the price fixed by the Company's present Act.

The *Bournemouth Gas and Water Bill* is to confer extended powers on the Bournemouth Gas and Water Company. The present capital of the Company is £100,000, fully paid up, and they have borrowed £25,000. By this Bill, the Company seek power to raise additional capital to the amount of £150,000, and to borrow to the usual extent thereof. The new capital is, of course, to be offered by auction or tender, under the conditions fixed by Mr. Raikes' Standing Order. It is proposed to enact that the Company shall supply the public lamps by meter, if required by any Local Authority within their limits.



The *Cleveland Gas Bill* is to extend the limits of the Cleveland Gas Company, and enable them, if they can, to purchase the Gas-Works of the North-Eastern Company at Marske, and to supply that place and Saltburn-by-the-Sea. The present nominal capital of the Company is £50,000, of which only £23,000 has been raised, and the Company have no mortgage debt. Power is now sought to raise £30,000 additional capital, carrying the usual borrowing powers. The new capital is, of course, to be offered by auction.

The *Exeter Gas Bill* is to authorize the Exeter Gas Company to raise further capital. The present capital of the Company consists of £40,000 original, entitled to ten per cent.; £10,000 four per cent. preference stock; and £20,000 in five per cent. preference shares. By this Bill, the Company seek authority to raise a further sum of £130,000, carrying borrowing power to the usual extent. The new capital is to be offered by auction or tender, and the dividends on the new capital are limited as usual, subject to the sliding scale. The standard price of gas it is proposed to fix at four shillings per thousand, and the quality is to be fourteen candles, tested by Sugg's new "London," No. 1, burner.

The *Farnworth and Kearsley Gas Bill* is to enable the Farnworth and Kearsley Gas Company to raise further capital. The present capital of the Company is £61,000, all of which has been expended; and since they have converted the borrowed money into share capital, they have now no mortgage debt. This Bill is to authorize the Company to raise an additional sum of £100,000, by the issue of new shares, and to borrow £25,000. The dividends on the new shares are limited as usual, and these shares are, of course, to be sold by auction or tender. The last Act obtained by the Company was passed in 1868, so we have here the General Act of 1871 incorporated. The testing-place is to be that at present existing at the works; the test burner is to be Sugg's new "London," No. 1, and gas of not less than fourteen-candle power is to be supplied.

The *Hartlepool Gas and Water Bill* is to confer additional powers upon the Hartlepool Gas and Water Company. The Company have already raised capital to the amount of £200,000, and also borrowed £50,000, all of which money has been expended on their undertakings. Power is now sought to raise another £200,000, and to borrow to the usual extent. The dividend on the new capital is limited to seven or six per cent., according as it is raised. As this is a mixed undertaking, neither auction clauses nor the sliding scale is proposed. Gas of fourteen-candle power, tested by Sugg's new "London" Argand, is to be supplied, and a testing-place is to be erected at the works within twelve months. No alteration as to the price of gas is proposed.

The *Radcliffe and Pilkington Gas Bill* is to confer extended powers on the Radcliffe and Pilkington Gas Company, who have raised and expended upon their undertaking £100,500. Power is now sought to raise additional capital to the amount of £120,000, and to borrow in the usual proportion. The dividend on the new capital is limited as usual. No auction clauses are inserted in the Bill. To comply with the provisions of the General Act of 1871, it is proposed to enact that the existing testing-station shall be deemed sufficient for the purposes of the Act, and that the gas shall be tested by a fifteen-hole Argand burner, with a seven-inch chimney.

The *Torquay Gas Bill* is to authorize an extension of the powers of the Torquay Gas Company, who have already raised and expended share capital to the extent of £45,000, and have borrowed £5000. Power is now sought to raise £30,000 by the issue of new shares, and to borrow to the extent of one-fourth of that sum. The dividend on the new capital is limited as usual, and the shares are to be sold either by auction or tender. Gas of fourteen-candle power is to be supplied, tested by Sugg's new "London" burner.

The *York United Gas Bill* is to extend the limits and powers of the York United Gaslight Company. The new capital to be authorized by this Bill is to be £100,000, carrying the usual borrowing powers. Neither auction clauses nor sliding scale is proposed. Gas of fourteen-candle power is to be supplied, tested by Sugg's burner, and a testing-station is to be erected at the works within three months of the passing the Act.

In all the above Bills there is provision made for the payment of interest on money deposits.

The Bill of the Imperial Continental Gas Association is *visu generis*. The £50 shares of the Association have been paid up to the extent of £43 15s., and as they have expended large sums out of revenue on extensions and improvements of their undertakings, the object of this Bill is to obtain power to write up all the capital as fully paid, and convert the shares into stock. The Bill further seeks power to repeat this operation whenever the

opportunity occurs, and also to reduce the nominal amount of capital, whenever it is deemed desirable, by returning money to stockholders in proportion to their several holdings.

Ten Bills are promoted, either to effect the compulsory purchase of Gas Companies by Local Authorities, or to sanction agreements for purchase already entered into between Companies and Local Bodies.

The *Bangor Local Board Bill* is promoted to empower the Local Board to make a compulsory purchase of the Bangor Water and Gas Company. The Bill gives no indication of the terms of purchase, which, if the Bill should pass, will be settled by arbitration or agreement.

The *Clitheroe Gas, Water, and Improvement Bill* is, *inter alia*, to sanction the purchase of the Clitheroe Gas Company by the Corporation, upon terms already arranged. The consideration for the purchase is annuities of five per cent. upon Class A and B shares, ten per cent. on C and D shares, and seven and a half per cent. to the holders of ordinary shares, together with a bonus of £3325 for uncalled capital and back dividends. The transfer was to have taken place on the 1st of July last, up to which time the Company received all moneys and discharged all debts.

The *East Retford Borough Bill* is, among other things, to enable the Corporation of the Borough to acquire the undertaking of the East Retford Gas Company. The consideration to be paid is a lump sum of £24,000, or, if the Shareholders prefer, annuities. The transfer is to take place on the 1st of July next, up to which date the Shareholders may receive ten per cent., and, if profits allow it, a further sum to make up back dividends. If the purchase be not completed on the day named above, the purchasers are to pay interest at the rate of five per cent. Until the purchase is completed, the vendors are to continue to carry on the undertaking for their own benefit, it being stipulated that in the meantime no further liabilities be entered into without the consent of the Corporation. The Corporation seek power to borrow as much money as they require for the execution of this Bill.

The *Leicester Corporation Gas Bill* is to sanction the transfer of the Leicester Gas Company to the Corporation, upon terms which have been agreed upon. These have been stated more than once in our columns, but may here be briefly recapitulated. The Corporation undertake to pay the owners of C shares £20, B shares £21 8s. 7d., and A shares £32 17s. 2d. per share, and the payment is to be made by the issue of an equivalent amount of debenture stock, bearing interest at four per cent. The Corporation assume the mortgage debt, which will constitute a first charge on the profits of the undertaking, and of the borough fund. The debenture stock may be redeemed by the Corporation at a rate not exceeding twenty-five years purchase. Power is sought to borrow the amount necessary to pay the cost of obtaining this Act, also a sum not exceeding £55,000 to pay off the mortgage debts of the Gas Company, and a further sum of £200,000 for gas purposes. It is proposed to apply the surplus profits of the undertaking to the District Fund.

The *Limerick Corporation Gas Bill* is to authorize the Corporation to purchase the gas undertaking of the United General Gas Company. The consideration to be paid is £26,000. The Corporation seek power to raise £54,000. Gas of fourteen-candle power is to be supplied, at a maximum of five shillings per thousand feet within the borough, and six shillings beyond that limit. Meter-rent is included in the price of gas. Surplus profits to be carried to the Improvement Fund.

The *Mansfield Commissioners Gas Undertaking Bill* is to authorize the transfer of the Mansfield Gaslight Company's undertaking to the Mansfield Improvement Commissioners. The consideration to be paid for the transfer is £37,500. The Commissioners assume the mortgage debt. A small compensation is made to the Directors and Secretary of the Company, and it is proposed to allot £300 to the widow of the late Manager of the Company, Mr. Kitching. The Commissioners seek power to issue debenture stock at four per cent., to the amount of the purchase-money. Surplus profits, when gas is charged at 4s. per thousand, or under, may be carried to the paving-rate. When the price exceeds 4s., such profits must be applied in reduction of price.

The *Newbury Borough Extension Bill* is, among other things, to authorize the Corporation of Newbury to take over the undertaking of the Newbury Gas Company. The gas-works stand on Corporation ground, of which the Company had only a fourteen years lease, and an agreement had been made that, when the lease expired, the undertaking should be sold to the Corporation at a valuation. Power is sought by this Bill to borrow £25,000 to complete the purchase. The prescribed quality of



the gas is fourteen candles, at a maximum price of 5s. 6d. per thousand cubic feet. Surplus profits are to be paid to the Borough Fund.

The *Newry Gas Bill* is intended to effect a compulsory purchase of the Newry Gas Company. It is proposed that within six months of the passing of the Act the Commissioners of Newry may give notice to the Company, who thereupon will be required to sell, either by agreement or arbitration. If they obtain the undertaking, the Commissioners propose to supply fourteen-candle gas, at a maximum price of 5s. per thousand cubic feet. Any balance of profit it is intended to devote to the improvement of the town and benefit of the inhabitants.

The *Stoke-upon-Trent Corporation Gas Bill* is to confirm an agreement entered into between the Corporation of the Borough and the Stoke, Fenton, and Longton Gas Company for the transfer of the gas undertaking of the latter. The capital of the Company is £34,000, and the consideration for the purchase agreed upon by the Corporation is £85,000, the Company retaining their reserve-fund. The transfer is to take place on the twenty-ninth of September next, until which date the Company carry on their undertaking as usual. The purchase is to be carried into effect by a joint Committee of the Corporation and the Local Board, each of which bodies seek power to raise £55,000 for the purposes of this Act. The maximum price of gas is to be 5s. per thousand. Surplus profits are to be divided between the two authorities, in proportion to the quantity of gas consumed in their respective districts.

The *Sutton-in-Ashfield Gas Bill* is to effect the transfer of the Sutton-in-Ashfield Gas Company to the Corporation, on terms already agreed upon between them. The consideration to be paid for the undertaking is £16,250. The Local Board seek to borrow on mortgage £30,000, and as much more as the Local Government Board may see fit to allow.

In all these Bills the borrowed money is to be paid off by means of a sinking-fund at various periods, ranging from sixty to eighty years. The usual notice of the allotment of the money for the purpose is to be sent to the Local Government Board.

Seven Bills are promoted to confer additional powers on Local Authorities in respect of their gas undertakings.

The *Burton-upon-Trent Commissioners Bill* is to enable the Commissioners to construct additional gas-works, for which, and other purposes, they ask power to borrow £10,000.

The *Castleford Local Board Bill* is a competing Bill, promoted to obtain authority for the Board to make and maintain gas-works to supply their own district, Whitwood, and several other surrounding parishes and parts of parishes. The Board propose to supply fourteen-candle gas, at the maximum price of 4s. per thousand. Power is sought to borrow £60,000.

The *Dalton-in-Furness Local Board Bill* is to authorize the Local Board, who have power to, and do to a small extent, manufacture gas, to purchase the Dalton works of the Barrow-in-Furness Corporation. The consideration agreed upon is £2000. Power is also asked to construct additional works, with the consent of the Local Government Board. The Board propose to supply fourteen-candle gas, at a maximum price of 5s. 6d. per thousand, and to erect a testing-station before they commence the supply. The Board seek to borrow £17,000 in respect of their gas undertaking, and wish to apply the surplus revenue to public purposes.

The *Drumcondra, Clontiffe, and Glasnevin Township Bill* is to consolidate the districts named into one township, and to authorize the election of a body of Commissioners for the purpose of local self-government. Among other things, it is proposed to give the Commissioners power to contract for the supply of gas.

The *Hamilton Burgh Bill*, while providing for several improvements in the burgh, so far as it relates to gas, only continues the authority of the Town Councillors to make and supply gas.

The *Maryport Improvement Bill* is, among other things, to authorize the Improvement Commissioners to alter the price of gas, which is now to be 4s. per thousand cubic feet, with a discount of ten per cent. to large consumers who pay promptly. In case of insufficiency of revenue of the gas undertaking to meet the demands upon it, the Commissioners seek power to levy a special gas-rate; but no such rate is to be levied when gas is sold under the maximum price.

The *Nottingham Improvement, Gas, and Water Bill* is, among other things, to enable the Corporation to construct additional gas-works, for which purpose they ask power to borrow, but what sum is to be applied for gas purposes is not stated in the Bill.

## BOARD OF TRADE REPORT ON THE GAS AND WATER BILLS, SESSION 1878.

The Board of Trade have presented their usual report to the House of Commons, at the commencement of the session, upon all the Railway, Canal, Tramway, Gas, and Water Bills to be promoted this year.

*Gas and Water Bills.*—72 Bills have been deposited. Of these 27 relate to the supply of gas only, and 12 to the supply of gas and water, 18 being proposed by Corporations of cities, or Local Boards, 6 by new Companies, and 15 by existing Companies.

Thirty-three Bills relate to the supply of water only, 15 being proposed by Corporations of cities, or Local Boards, 6 by new Companies, and 12 by existing Companies.

The total of the sums proposed to be raised by these 72 Bills amounts to £9,683,273.

*Gas and Water Provisional Orders.*—22 applications have been made to the Board of Trade for Provisional Orders, 10 for purposes relating to the supply of gas, 8 relating to the supply of water, and 4 relating to the supply of both gas and water.

The total sums proposed to be raised by these Provisional Orders amount to £359,000.

The capital proposed to be raised for water-works purposes does not include the sums to be expended by the Metropolitan Board of Works if their schemes are successful. The estimated outlay in this case is unspecified.

## GAS ENGINEERS' AND SUPERINTENDENTS' POCKET ALMANAC FOR THE YEAR 1878.\*

This handy little publication is issued by the American Meter Company, and, of course, is intended more for Transatlantic Gas Engineers and Managers than for those in this country; but there are many items of information scattered through its pages, which will be useful to gas officials in any part of the world.

Besides the usual almanac, the work contains a Gas Engineers Calendar, with lighting tables for each month, and columns for registering the daily make and consumption of gas, the quantity in stock, and the weight of coal carbonized, with the yield of gas per pound of coal. The production is usually reckoned per pound of coal in the States, though we do not know that there is any advantage in this over our own plan of calculating by the ton. The book also contains instructions for testing meters, a number of photometrical and other tables, and blank leaves for memoranda. Even the advertisements are interesting, as exhibiting some of the peculiarities of our "American Cousins" in this line of business.

## LIGHTING BY ELECTRICITY.

(Continued from page 121.)

Of course, it would be out of the question to pretend to judge the expected merits of Fontaine's lamp (referred to last week) from what we have now before us; we therefore simply remark that whatever may be the result of trial, the improvement, if any, will not be found in the simplicity of its arrangements, consequently the question that has been so often asked concerning lamps of this nature, from 1845 to the present day, remains as pertinent as ever. "Why all this complication, seeing that the King lamp was so simple?" The answer obviously is: "Because the keeping two or more lamps in action on the same circuit, in such a manner that one cannot interfere with another, whether alight or otherwise, is so perplexing." The light of the incandescent lamp is produced, as we have before remarked, by the emission of rays from a piece of platinum or carbon, heated up to a point below that of fusion. At any rate, this expression is correct as far as platinum is concerned, and the reason for not continuing to use it, as first suggested in King's specification, is the difficulty of keeping below that point. Hence the use of carbon is generally resorted to; that substance being capable of undergoing the intense heating required, without fusion, at the same time remaining (whilst intact) a good conductor of electricity, and the light being formed without a breach, as is the case when produced by the voltaic arc, the circuit is complete in every respect. But carbon, when ignited, has a great affinity for oxygen, and to prevent its combustion when in the glowing condition necessary for the manifestation of light, the lamp must be so constructed as to admit of being exhausted of air, and capable of resisting a vitiation of the vacuum formed during the time such light has to be maintained. This renders the lamp cumbrous, and the re-formation of the vacuum every time the lamp is opened is not a recommendation. Although the carbons do not fuse, they often fall to pieces and otherwise give trouble, the extent of which may be gathered by a description and drawing of the Konn lamp, which was designed especially to compensate some, if not all, of the perplexities of this mode of developing light, and at the same time to preserve an unbroken circuit for other lamps in advance. When this lamp is fully trimmed it has five carbons of the same length, set in a circular plate, which is in metallic contact with the negative conductor. The upper ends of these carbons enter the socketed ends of five copper rods, of slightly varying lengths, so that by this means a metal plate hinged to the positive conductor, and overlying them all, only touches one at a time. The electric current when turned on passes first through the one in contact with the hinged conductor, and as long as this carbon remains intact produces incandescence; the carbon at the same time acting as a part of the circuit. When this carbon breaks, the plate falls to the next tallest, and so on, until all the carbons are broken. The plate then rests on the end of a metal rod, which keeps the circuit com-

\* Issued by the American Meter Company, Philadelphia.



plete, should the current be required onward. M. Fontaine thus describes the Konn lamp:—

In 1875, M. Konn, of St. Petersburg, patented a more practicable lamp (represented in fig 14), which was constructed for the first time in France by M. Duboscq.

This lamp is composed of a copper base, A, upon which are fixed two spur-posts, N, for attaching the conductors; two copper rods, C, D, and a small valve, K, opening outwards from within. A globe, B, enlarged in its upper part, is held upon the base by means of a bronze nut, L, pressing upon an india-rubber ring. One of the vertical rods, D, is electrically isolated from the framework, and communicates with a spur-post, also isolated. The other rod, C, is composed of two parts—first, of a tube fixed directly upon the base, without isolation; and, secondly, of a piece of copper rod, slit for a portion of its length, thus giving it elasticity, and allowing it to slide in the tube, but to remain fixed unless a certain effort is brought to bear upon it. The retort carbons, E, to the number of five, are placed upon the two small plates surmounting the copper rods, C, D. Each carbon is introduced into two small blocks, also of carbon, which receive copper rods at their extremities. These rods are alike at their lower part, but of unequal length at the upper part. A hinge-joint, I, is articulated upon the rod, C, and rests upon the rod of a single carbon at a time.

If the lamp be placed in a circuit, by attaching the two conductors of a pile to the spur-posts, N, N' (the latter is concealed by the former, but it is identical in character, and is not isolated from the base), the carbon rod, E, is traversed by the current, which passes through the medium of the hinge-joint, I, the copper tube, F, the two blocks of carbon, O, O, the copper rod, G, and the plate surmounting the rod, D. A vacuum has previously been produced by attaching to the valve, K, the pipe of an air-pump, or any other pneumatic machine. The carbon rod, E, reddens, becomes white, and then luminous. At first the light is white, steady, and constant; then by degrees the section diminishes, the carbon breaks, and the light disappears. The hinge-joint, I, then falls upon another carbon rod, and the light is re-established almost instantaneously. When all the carbons have been used up the hinge-joint rests upon a copper rod, H, and the current remains unbroken. In this manner, if several lamps are supplied from the same generator of electricity, the extinction of one does not involve the extinction of the others.

In order to avoid the projection of pieces of broken carbon against the glass, M. Konn places in the lower part of his lamp a thin copper tube, M, which receives the fragments until the plates are again replenished.

Three of these lamps, worked by an Alliance machine, have been in operation for the past two years at the establishment of M. Florent, a merchant in St. Petersburg. Each carbon lasts about two hours, with the exception of the first, which is almost immediately consumed. The light is very agreeable, but costs considerably more than gas.

The principal cause of the great expense attending the light, while burning, is the difficulty of preparing the small carbons, the market price of which is over 5 francs per mètre.

Resuming our extracts from M. Fontaine's chapter on "The Divisibility of the Light," we remark that the author introduces us rather suddenly to some experiments, by M. de Changy 20 years ago, that appeared big with expectations, at that time, respecting the divisibility of the electric current for lighting purposes. He says:

It has never been quite understood how M. de Changy operated; all that can be said is that his laboratory experiments were perfect, especially when judged by the following communication made to the Academy of Sciences on Feb. 27, 1858:—

"I hasten to communicate to the Academy the important discovery of the divisibility, for lighting purposes, of the electric current coming from a single source, in as many wires as may be desired, from a night-lamp to a beacon light.

"It is known that the luminous arc produced between two carbons is capable of giving but one focus—very intense, very unstable, very disagreeable, and very costly. M. de Changy, a young chemist, who is at the same time a physicist, mechanic, and practitioner, thoroughly conversant with the new discoveries and instruments, has just solved the problem of the divisibility of the galvanic current.

"It is after having just left his laboratory, where he has been working alone for the past six years, that I proceed to give a brief sketch of what I there saw—namely, a pile of twelve Bunsen elements perfected by him, producing a constant luminous arc, without intermittence or crepitation, between two carbons brought nearly together by a regulator of M. de Changy's invention, which is the simplest and most perfect that I am acquainted with; there were likewise a dozen small miners lamps, moveable upon rods or copper wires. Any one of these lamps, or the entire number, could be lighted or extinguished at pleasure, without affecting the intensity of the light in the neighbouring lamps. The light was as white and as pure as that of the Gillard gas, with which it has this point of similarity—that it is produced by the incandescence of the platina. The lamps were enclosed in glass tubes, hermetically sealed, and were intended to be employed in lighting mines, or for placing in street-lamps, the entire number of which in a town could be lighted or extinguished by opening or closing the circuit. The gas conduit-pipes would then be replaced by simple wires, and consequently neither explosions, fires, nor bad smells would be occasioned.

"All attempts to produce the electric light by the incandescence of platina have up to now been unsuccessful, in consequence of the wires

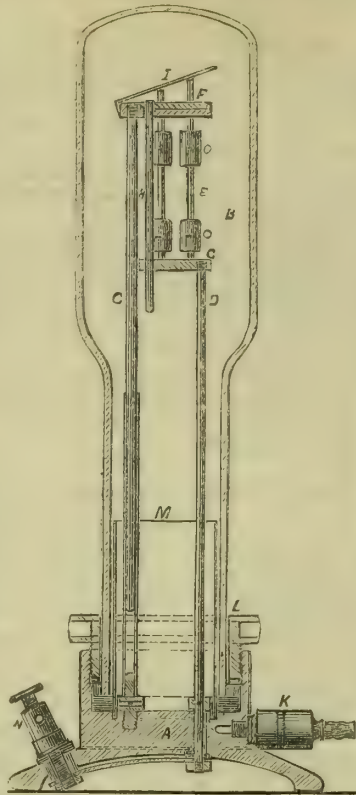


FIG. 14.

melting for want of a regulator to divide the current, and it is this problem that M. de Changy has solved most completely. He estimates that this light will not cost one-half as much as gas. A lamp placed at a mast-head would make a permanent signal, which would last more than six months without the platina requiring to be changed. If several lamps were placed in tubes of coloured glass, as they could be lighted or extinguished rapidly from below, nothing would be more easy than to convert them into night telegraphs. With regard to coast signal-lights, the focus could be made of such a size that its luminous range would exceed that of all the lighting apparatus known up to now.

"I also saw a luminous spot in thick glass, which could be immersed in water to considerable depths without being extinguished by movement. It has already been tried in a river, and has served for catching fish, which are attracted and not frightened by the light. It is probable that in the course of time the inexhaustible sea will nourish the earth, and that miraculous draughts of fishes will be so no longer.

"This short sketch will suffice to show you to how many different purposes this discovery may be applied—a discovery to which I have the honour of calling the attention of the Academy, with the conviction that I have not been the dupe of an illusion, notwithstanding my astonishment at seeing a lamp light itself in the hollow of my hand, and remain alight when covered with my handkerchief and put into my pocket."

It must not be supposed that this communication was made by a person who was a stranger to science, and susceptible of allowing himself to be deceived by an enthusiastic inventor. No. It emanated from the vigorous mind of that living scientific repository, M. Jobart, of Brussels.

We have not been able to procure the drawings of the dividing regulator invented by M. de Changy, but have seen the one contrived by MM. Lacassagne and Thiers, which they patented in 1854. The theory of this apparatus rested upon the following observations, which we extract from the patent.

It is known that when, in order to reach its destination, a current is obliged to pass through a liquid of less conducting power than the conductors employed, the intensity, or the quantity of electricity set in motion in a given time, is in inverse ratio to the resistance offered by the interposed liquid. This resistance may be increased or diminished either by increasing or diminishing the conductivity of the liquid, or by increasing or diminishing the immersed surface. It is also known that the magnetic power of an electro-magnet varies with the intensity of the current; that when the surfaces of the immersed conductors are composed of an unalterable metal, the gas resulting from the decomposition of the liquid may be obtained in a free state; and that, finally, the quantity of gas obtained in a given time is in direct ratio to the intensity of the current.

In order to place these principles in a condition to produce the desired result, MM. Lacassagne and Thiers cut one of the conductors of a pile in action, in two, attached a plate of platina to each extremity, and suspended the plates in the interior of a glass gasholder bell. The gasholder contained some acidulated water. The glass bell rose or fell according as the gases formed were or were not allowed to issue. The rising of the bell naturally produced a diminution of galvanic intensity, while its descent produced the opposite effect. An electro-magnet furnished with a lever armature, having a counteracting spring, completed the arrangements.

The apparatus worked as follows:—First of all the spring attached to the electro-magnet was regulated in order to obtain a determined current. So long as the magnetic attraction was greater than the tension of the spring, the armature remained in contact, and the gases produced by the decomposition of the water not being able to escape, caused the bell to rise, thus lessening the points of contact of the plates of platina, and consequently the intensity of the current. There came a moment when equilibrium was established, and even when the strength of the spring exceeded that of the magnetism; the armature of the electro-magnet then receded, opened a tap by which a small quantity of gas escaped, and then things once more quickly took their normal course. In a well-arranged regulator the tap remained constantly partly open, and the armature was brought very near to the electro-magnet, but without ever touching it.

It is easy to conceive that a similar regulator applied to each of M. de Changy's small lamps would prevent the platinum wires from burning; but the complication that would result from this combination would render it absolutely inapplicable, even should there be no other inconvenience in practice.

MM. de la Rive and Elie Wartmann, both physicists at Geneva, have observed that with a well-acting pile and a very sensitive regulator the current may be broken for the thirtieth part of a second without any variation taking place in the arc, but that if the interruption lasts longer, the arc becomes fainter, and goes out altogether when the current has ceased for the tenth of a second.

Profiting by this observation, Mr. Le Roux obtained some very good results, which he communicated to the Academy of Sciences on Dec. 30, 1867. The following are some extracts from his communication:—

"The spark from the electric pile is generally incapable of jutting out between two separated conductors. [It has required 3500 elements, isolated with great care, to produce a spark of only a fraction of a millimètre in length.] The induction currents produced by the magneto-electric machines have a greater tension, and this explains the light produced by these machines with uncorrected currents.

"I have obtained the same results with a pile of 50 Bunsen elements; the current, which had been broken for the 25th part of a second, juttet out to the space of 3 millimètres. This fact would probably not be without interest as regards the applications of the electric light. I see in it a solution of the problem of the divisibility of this light, which up to now has been unsuccessfully attempted. However, a few conclusions may be deduced from this experiment. When the current passes between two conductors in such a manner as to produce the voltaic arc, it now appears probable that this passage was not conditional upon the voltaic arc itself, but upon the elevation of the temperature. The conductivity of the interposed medium is probably only an extension of that found by M. Edouard Becquerel in heated gases, and which would be considerably increased as a consequence of the very great elevation of the temperature. The carbon forming the electrodes may also at this temperature have a sensible vapour tension, and this vapour may help to increase the conductivity of the medium."

Mr. Le Roux has thus been able to divide the light, by sending, with the aid of a distributory wheel revolving with great rapidity, the current from a Bunsen pile alternately into two regulators, in such a manner that it should pass into each of them during the same number of fractions of a second. Under these conditions the two lights were perfectly equal.

In 1873 M. de Mersanne took out a patent for dividing the electric currents upon the principle adopted by M. Le Roux. The invention deals with principles of mechanical construction so elementary, so well known, and so little susceptible of being made the subject of a patent, that we should not even have referred to it, had not M. de Mersanne in the following year taken out an additional certificate showing an arrangement which, if not practicable, was at least original.

In this arrangement the distributory wheel employed by M. Le Roux is replaced by a horizontal shaft bearing a series of arms. Friction



rollers articulated to metallic rods receive from these arms an alternate movement, and cause several vertical rods to plunge into small cups filled with mercury. By moving the shaft with great speed, several lamps may by this means be successively put in contact with the voltaic current, and thus a single source of electricity be divided into several equal or unequal parts, according to the combination of the interrupters.

Last year, when passing through the great cities of the United States, we endeavoured to find out what had been done there in the matter of the electric light, and we nowhere found that it had received the slightest practical application. Several scientific men spoke to us of the attempts they had made to divide the current; but not one of them could show us an apparatus worthy of mention. We will simply notice, as being the most recent, the patent taken out by Mr. Henry Woodward, in 1876, relative to the incandescence of a carbon in a rarefied gas which possessed the property of not combining chemically with the red-hot carbon.

(To be continued.)

## Communicated Article.

### ON A RAPID AND ACCURATE METHOD OF ESTIMATING SULPHUR IN COAL GAS.

By Mr. W. C. YOUNG, F.C.S., Etc.

Public Analyst for the Poplar District, and Gas Examiner at Beckton to the Corporation of the City of London and to the Metropolitan Board of Works.

The process in use at the testing-places under the control of the Gas Referees, for the estimation of sulphur in coal gas, although giving accurate results in the hands of experienced operators, is attended by so many difficulties, and takes so much time for its completion, that it is not surprising that a general wish should be felt for some means which would enable gas managers, without special training, to obtain equally accurate results, with the same apparatus, in a very much shorter space of time.

The process about to be described is based upon sound chemical principles, gives more accurate results than the one commonly in use, takes a very short time to complete, and, moreover, the chances of error are so slight, that a person of ordinary intelligence would obtain, for all practical purposes, as perfect results as the most experienced chemical manipulator.

Before proceeding to details of the method, and in order to explain its principle, it is necessary to consider the nature of the substances to be dealt with.

In the liquor given by the Referees apparatus, there are present carbonate of ammonium and sulphate of ammonium. Before converting the latter compound into sulphate of barium, it is necessary to decompose the former, which is effected by boiling the liquid with an excess of hydrochloric acid, chloride of barium being afterwards added. There is then present the excess of chloride of barium, hydrochloric acid, chloride of ammonium, and sulphate of barium.

Now, as hydrochloric acid and chloride of ammonium are readily volatile, whereas chloride of barium is not, it follows that, if the quantity added of the latter be known, then the amount left, after volatilizing the two former, must be the excess of chloride of barium added, the difference being clearly due to the chloride of barium required to decompose the sulphate of ammonium.

The chlorides admit of easy estimation; indeed, the process by which it is effected is at once the most accurate and simple in the domain of volumetric analysis; so that we have in this way a ready indirect means of ascertaining the amount of sulphate of ammonium contained in the liquor given by the Gas Referees apparatus.

My mode of applying this principle is as follows:—The apparatus is used in the ordinary way, excepting that an upright eduction-tube 12 inches long is employed, in order that the bulk of the liquor obtained may be small. If 10 cubic feet have been burned, the liquor and washings are made up to 500 septems (half a deci-gallon), well mixed, and 25 septems (1-20th part) measured by a pipette for the experiment. To this is added a slight excess of acetic acid (two drops is generally sufficient) and 10 septems, measured by a pipette, of a standard solution of chloride of barium, containing 1625 grains in one gallon. The whole is then transferred to a shallow flat-bottomed platinum capsule, and evaporated to dryness over a burner. The evaporation can be conducted over an Argand or rose Bunsen burner, the heat being adjusted so as to keep the liquid just below boiling, and so prevent possible spurting; but, where a number of estimations are being made simultaneously, it is best done on a water or steam bath. After evaporating to dryness, the residue is gently heated until the crucible is at a slight red heat; it is then cooled, and the contents washed out with water into a small beaker. To this solution an excess of a solution of yellow chromate of potassium is then added, and a standard solution of nitrate of silver, containing 531.2 grains per gallon, is added from a burette containing 50 septems (graduated into fifths of a septem), until a permanent change of tint is observable on shaking the liquid.

Each septem left in the burette indicates one grain of sulphur per 100 cubic feet of gas, and each division .2 grain.

As many of those for whose benefit this process is intended may be unacquainted with the use of a standard solution of nitrate of silver for estimating chlorides, a few words explanatory of the process may not be out of place here.

When a solution of nitrate of silver is added to a mixture of soluble chromate and chloride, there is produced at first a deep red precipitate of chromate of silver, which is immediately converted into the white chloride of silver, the colour at once disappearing. This action goes on until the whole of the chlorides present have been precipitated, and then the deep red chromate of silver formed is unaffected, and so marked is the change in the colour, that one drop in excess of the standard solution of nitrate of silver employed in my process produces such a decided red tinge, that no one could be mistaken.

This one drop would introduce an error of less than .2 grain of sulphur per 100 cubic feet of gas.

The process of evaporation, as directed, takes at the most fifteen minutes, the rest of the work needing a few moments more, and as the result must necessarily be at least as accurate as that given by the tedious gravimetric method, the process will, I have no doubt, commend itself to those who desire to know in a short time the sulphur contained in the gas under examination.

Moreover, should the result of a test appear at all extraordinary, it can readily be checked by a repetition, or by a separate gravimetric estimation, as only a very small quantity of the liquid is used.

Should the gas contain more than 50 grains of sulphur per 100 cubic feet, it will be necessary to make the bulk of the liquor up to one deci-gallon (twice the quantity before directed), proceed as usual, and multiply the number of septems of standard nitrate of silver solution remaining by two, to find the amount of sulphur present.

If a "short" test is desired, one-half of a cubic foot should be burnt, when, if the whole of the liquor be taken, the number of septems of standard nitrate of silver solution remaining will indicate the number of grains of sulphur per 100 cubic feet.

All the apparatus needed for this process, together with the standard solutions, guaranteed correct, may be obtained of Mr. Sugg, Vincent Works, Vincent Street, Westminster.

Gas Examiner's Laboratory, Beckton Road, North Woolwich, London, E., Jan. 21, 1878.

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### AITKEN AND YOUNG'S PROCESS.

SIR,—During the discussion of Mr. Young's paper read at the West of Scotland Association of Gas Managers Meeting, held at Greenock, in April, 1876, and reported in your issue of May 23, 1876 (p. 781), Mr. Key made the following remarks:—"I remember calling upon Mr. Walker, of Ayr, late of Kilmarnock, and I noticed he had a large hydraulic main, 3 feet square, over his benches. I have no doubt the object he had in view was to pick up the hydrocarbons in travelling over a heated surface. I think that must have added to his gases very much. I remember a few years ago having a tank, into which I ran the liquors from the hydraulic main, and I kept it up to the boiling point. I made a large volume of gas at the time—upwards of 13,000 cubic feet. When the liquors in the tank came up to the boiling-point they would boil over, and that was dangerous, because of the fire. One day the tank boiled over, and I got a good scald. The object, however, is a correct one, and the application of steam is a nice idea, because you have steam more under control. I must say the whole thing is got up in a very natural and scientific manner; and as to the results, I thoroughly concur with Mr. Young."

From these remarks it will be evident that, at the date of that meeting, Mr. Key was of opinion that the object of the process was a correct one, and that the passing of the gases over heated tars would add to their value very much. Indeed, it would appear, or, rather, Mr. Key insinuates—or, at least, leaves his hearers to infer—that he had been aware of that fact for some time, since he had a few years previously employed a tank, in which he heated his tars with a similar object, and that it was solely in consequence of fire being dangerous that he abandoned the use of the arrangement. He pointed out, however, that the use of steam in the Aitken and Young process entirely obviated this defect.

How can Mr. Key reconcile those statements with the assertions in his letter which appeared in your issue of the 15th? He there tells us that he employed the fire to the tank referred to for an entirely different purpose, that it was applied not with the view of volatilizing the naphthas into the gas, but for the purpose of melting the tars collected from his hydraulic main, those tars being so thick and pitchy that they would not otherwise flow to the tar-well, in consequence of the mode in which he conducted the carbonizing of the coal decomposing all the naphthas into gas, and thereby producing 13,800 cubic feet of gas per ton of coal carbonized.

The following monthly statements of the gas manufactured in Dumbarton Gas-Works in the year 1872-73, will show how badly his recollection has served him on this occasion:—

Month.	Make per Ton. Cubic Feet.
From May 16 to June 30, 1872 . . . . .	9,986
July 1872 . . . . .	9,625
August " . . . . .	7,168
September " . . . . .	10,701
October " . . . . .	10,414
Average . . . . .	5) 47,894
	9,578
November, 1872 . . . . .	12,117
December, " . . . . .	13,327
January, 1873 . . . . .	12,696
February " . . . . .	12,637
March " . . . . .	12,337
April " . . . . .	10,825
Average . . . . .	6) 73,939
	12,323

In the first, or summer six months, you will observe that the actual average make per ton was 9578 feet, that given by Mr. Key being 11,600 feet, making a deficit of 2022 cubic feet per ton. In the winter months you will also note that the actual average make was 12,323



feet (not a bad make), instead of 13,300 feet; as given by Mr. Key, making a deficit of 977 cubic feet per ton.

"Those results, also, Mr. Key asserts, he obtained "by the ordinary process, and that by no means in perfect order." Whereas, in reality, Mr. Key was using a setting of retorts for which he had applied and obtained a patent. I am not sure whether, during this year, the settings were wholly adopted, but I know they were so partially, and in the following year they were wholly introduced, with the following results:—

Month.	Make per Ton. Cubic Feet.
July 1873 . . . . .	9,629
August " . . . . .	10,276
September " . . . . .	10,533
October " . . . . .	11,271
November " . . . . .	10,243
December " . . . . .	10,156
January, 1874 . . . . .	10,068
February " . . . . .	10,169
March " . . . . .	9,653
April " . . . . .	7,120
May " . . . . .	7,116
June " . . . . .	5,906

12)112,140

Average . . . . . 9,345

One would have thought that Mr. Key's position would have made him hesitate before writing the extraordinary letter, which recently appeared in the JOURNAL. He must have been aware that the process in question was being carefully investigated at one of the Glasgow Gas-Works. It is a great pity he did not wait until Dr. Wallace's report was published. This would have had the effect either of deterring him from making such a communication, or, if he still persisted in his own opinion, he might then have added another sentence to his letter, somewhat to this effect—that, notwithstanding the acknowledged high abilities of the experimenters, the Dalmarnock Gas-Works were, like those at Hamilton, ripe for improvement in some way or another unknown to them.

Gas-Works, Dumbarton, Jan. 22, 1878.

JAMES M'GILCHRIST.

#### SALES OF GAS ACT.

SIR,—As it seems not improbable the above Act may be remodelled this session (and, if so, not before it is needed), I beg to throw out the suggestion that the Board of Trade would make the amended Act none the less valuable, by asking for the opinions and experiences of many of the most experienced inspectors in the provinces, as well as of those in the Metropolis. Meter makers will give valuable information, of course, but more from their own stand-point of view as manufacturers; but, on the other hand, I think the inspectors, who are brought more into contact with the consumers of gas, and whose experience and knowledge of meters of various makers is manifold, could also give much useful information, not only as to the need of a more thorough and efficient test being required, but in what form it is most desirable to make it, so as to secure an impartial and reliable instrument in the measurement of gas.

JAMES URQUHART.

Gas-Meter Testing Office, Bootle Street, Peter Street,  
Manchester, Jan. 25, 1878.

#### BRITISH ASSOCIATION OF GAS MANAGERS.

SIR,—In a few months the Annual Meeting of the British Association of Gas Managers will be held. I am sure you will agree that it is the duty of every member to contribute, as far as he can, to increase the interest of the meetings. With this view, I take the liberty of suggesting that an exhibition be held, at least every alternate year, in connection with the Association; the exhibition to consist of models of the most recent improvements in apparatus for the manufacture and distribution of gas, and the application of gas to domestic, manufacturing, and scientific purposes.

Prizes are awarded by the Association for the best papers read at the meetings, and if, in the same way, prizes were awarded for the most suitable cooking and heating apparatus, for the best burner, and the most economical gas-engine, I am sure it would ensure a very satisfactory result.

At first sight it may appear that there are difficulties in the way of carrying out this project; but on reflection it will, I think, be seen that the amount of practical good which must result from it will more than counterbalance any difficulties.

Perhaps the first question to be asked is, From whence are the funds to be procured? In the success of the undertaking there are three classes interested—viz., Gas Companies, Manufacturers, and Members; and, as such, each has a duty to perform. I am sure that Gas Companies will readily recognize their part, and contribute sufficient funds. When you look at the number of well-to-do Gas Companies in existence, a comparatively small contribution from each would be ample.

The Manufacturers of gas apparatus will not only, indirectly, bear a portion of the expenses, by sending their goods free of cost, but many, I have no doubt, will be found to offer a contribution to the funds.

As to the Members, I certainly think they ought not to be expected to contribute in this way. Theirs is the intellectual portion, and every encouragement should be offered to them to give the results of their improvement in the shape of working models and drawings. Permit me to remark that, in my opinion, there are many who would not be tempted to read a paper, yet would take a pride in producing an ingenious model, the outcome of many hours of patient thought. Instances are not rare where, by such means, the germs of some of the most valuable discoveries first came to light.

But it may be said that the time of the meeting is fully occupied with reading papers, and the discussions which necessarily follow. Granted; but, when suggesting that the exhibition be held every alternate year, it is in my mind that London would be found the most central for carrying it out. I know from experience that the majority of the members from the provinces are to be found in town on the day pre-

vious to the meeting; and, if the exhibition were opened on that day, it would in no way interfere with the usual proceedings of the Association.

The evening of the exhibition could also be taken advantage of for holding an agreeable *conversazione*, at which the freedom of intercourse and the easy interchange of ideas would not be the least important feature in the undertaking.

Cork, Jan. 24, 1878.

THOMAS TRAVERS.

## Parliamentary Intelligence.

### GAS AND WATER BILLS, 1878.

A memorial complaining of non-compliance with the Standing Orders, in respect of the Waterford Corporation Water and Improvement Bill, has been deposited from Joseph Fisher and Nathaniel W. Allen, as members of the Corporation of Waterford.

### HOUSE OF LORDS.

MONDAY, JAN. 21.

#### CONSERVANCY BOARDS.

Lord RIFON called attention to the Report of the Select Committee of last session on Conservancy Boards, and observed that the issue was so important that he felt that he had no reason to apologize for bringing the subject under consideration. He referred to the evils in different parts of the country occasioned by the prevalence of floods, which he attributed in a great measure to the improvement in subsoil draining; and conceiving that urgent measures ought to be adopted to check the evils produced by the floods, he asked the Duke of Richmond whether it was the intention of the Government to introduce in the present session a Bill founded on the recommendations contained in the report.

Lord HUNTLY made some observations on the subject of rating for the purpose of defraying the expense of drainage works, and suggested that Commissioners should be appointed by the Government to inquire into the different cases.

After some observations from Lord LONGFORD and Lord SANDWICH,

The Duke of RICHMOND and GORDON admitted that the question was one of considerable importance and magnitude, and as the subject-matter of the report was under consideration, he expressed a hope that the Government would be able to deal at least with part of the subject before the end of the session.

TUESDAY, JAN. 22.

The LORD CHANCELLOR acquainted the House that the Standing Orders applicable to the following Bills have been complied with:—Bangor Local Board; Cheltenham Water; Cokermouth and Workington Water; Durham Water; Grand Junction Water; Limerick Corporation Gas; Marske and Saltburn Gas; Nottingham Water; Shrewsbury Gas; Southport Water; and that the Standing Orders applicable to the Nottingham Improvement, Gas, and Water Bill have not been complied with.

THURSDAY, JAN. 24.

The LORD CHANCELLOR acquainted the House that the Standing Orders applicable to the following Bills have been complied with:—Burton-upon-Trent Commissioners; Cleveland Gas; Deal Water; East Grinstead Gas and Water; East Retford Borough; Manchester Corporation Water; Metropolis Water Supply; Normanton Gas; Radcliffe and Pilkington Gas; Scarborough Water; Sevenoaks Water; South Staffordshire Water; and that the Standing Orders applicable to the Cheltenham Corporation Water Bill have not been complied with.

FRIDAY, JAN. 25.

The LORD CHANCELLOR acquainted the House that the Standing Orders applicable to the following Bills have been complied with:—Batley Corporation Water; Bradford Water and Improvement; Cardiff Water; Castleford and Whitwood Gas; Dublin Corporation Water-Works Acts Amendment; Farnworth and Kearsley Gas; Truro Water; York United Gas.

Bill read the first time and ordered for second reading:—Burton-upon-Trent Commissioners.

Bill read the first time and referred to the Examiners:—Deal Water.

### HOUSE OF COMMONS.

MONDAY, JAN. 21.

Mr. RAIKES reported that, in accordance with Standing Order, No. 79, he had conferred with the Chairman of Committees of the House of Lords, for the purpose of determining in which House of Parliament the respective Private Bills should be first considered, and that they had determined that the Bills contained in the following list should originate in the House of Lords:—Batley Corporation Water; Bedlington Local Board (Water); Castleford and Whitwood Gas; Castleford Local Board; Clitheroe Gas, Water, and Improvement; Dartmoor and Exeter Water; Deal Water; Dublin Corporation Water-Works Acts Amendment; Exeter Corporation Water; Exeter Gas; Forfar Water; Imperial Continental Gas Association; Leicester Corporation; Lichfield Gas; Mansfield Commissioners Gas; Newry Gas; Normanton Gas; South Staffordshire Water; Sutton-in-Ashfield Gas; Trowbridge Water; Warrington Water; Waterford Corporation Water and Improvement; York United Gas.

METROPOLIS WATER SUPPLY BILLS.—A petition against these Bills was presented from the Vestry of St. Pancras.

TUESDAY, JAN. 22.

Petitions were presented for the following Bills, which were ordered to be brought in:—Cokermouth and Workington Water, by Mr. Fletcher and Lord Muncaster; Durham Water, by Mr. Herschell and Sir Arthur Middleton; Limerick Corporation Gas, by Mr. Butt and Mr. O'Shaughnessy; Marske and Saltburn Gas, by Mr. Pease, Mr. Bolckow, and Mr. Dodds; Nottingham Water, by Mr. F. Smith and Viscount Galway; Shrewsbury Gas, by Mr. Cotes and Mr. Robertson; Southport Water, by Mr. Cross and Colonel Blackburne.

The Examiners report, "That the Standing Orders have not been complied with in the case of the petition for the Nottingham Improvement, Gas, and Water Bill," was referred to the Select Committee on Standing Orders.

Colonel BERESFORD gave notice that on Monday, Jan. 28, he would ask the Secretary of State for the Home Department whether he will use his influence to postpone the consideration of the Bill promoted by the Metropolitan Board of Works for the purchase of the Water Companies at a cost of many millions sterling, until that Board have, in accordance with the spirit of his recent reply to the Board, taken the necessary steps to prevent the recurrence of floods on the Surrey side of the water.

WEDNESDAY, JAN. 23.

Petitions were presented for the following Bills, which were ordered to be brought in:—Bangor Local Board, by Mr. R. Davies and Mr. Pennant;



Cheltenham Water, by Mr. Yorke and Mr. Agg-Gardner; Grand Junction Water, by Sir Henry Holland and Mr. Coope.

THURSDAY, JAN. 24.

Petitions were presented for the following Bills, which were ordered to be brought in:—Cleveland Gas, by Mr. Pease and Mr. Milbank; East Grinstead Gas and Water, by Mr. Grantham, Mr. Gregory, and Mr. Scott; East Retford Borough, by Mr. Foljambe and Mr. Beckett-Denison; Metropolitan Water Supply, by Sir James McGarel-Hogg, Sir Andrew Lusk, and Mr. Rodwell; Radcliffe and Pilkington Gas, by Mr. Egerton and Mr. Hardcastle; Scarborough Water, by Sir Charles Legard and Sir Harcourt Johnstone; Sevenoaks Water, by Mr. Goldney and Mr. Ryder.

Bills read the first time and ordered for second reading:—Bangor Local Board; Cockermouth and Workington Water; Marske and Saltburn Gas.

Bills read the first time and referred to the Examiners:—Cheltenham Water; Durham Water; Grand Junction Water; Limerick Corporation Gas; Nottingham Water; Shrewsbury Gas; Southport Water.

The Examiners report, "That the Standing Orders have not been complied with in the case of the petition for the Cheltenham Corporation Water Bill," was referred to the Select Committee on Standing Orders.

PUBLIC HEALTH (IRELAND) BILL.—This Bill was read a second time and committed.

FRIDAY, JAN. 25.

Petitions were presented for the following Bills, which were ordered to be brought in:—Bradford Water and Improvement, by Mr. W. E. Forster and Mr. Ripley; Cardiff Water, by Colonel Stuart, Mr. Morgan, and Major Lee.

The petition for the Cheltenham Corporation Water Bill was referred to the Select Committee on Standing Orders.

Bills read the first time and ordered for second reading:—East Retford Borough; Metropolitan Water Supply.

Bills read the first time and referred to the Examiners:—Cleveland Gas; East Grinstead Gas and Water; Radcliffe and Pilkington Gas; Scarborough Water; Sevenoaks Water.

## Legal Intelligence.

CLERKENWELL COUNTY COURT.—MONDAY, JAN. 21.

(Before Mr. WHITEHEAD, Judge.)

NEW RIVER COMPANY v. KENDRICK.

Defendant was summoned for  $2\frac{1}{2}$  quarters water-rent, due May, 1876, for water supplied at 223, Junction Road, Upper Holloway, at the rate of £1 16s. per annum, and  $5\frac{1}{2}$  quarters water-rent, due September, 1877, for water supplied to 147, Junction Road, at the rate of £2 6s. per annum—total, £4 5s. 9d.

It appeared that, by their Act of Parliament, the Company are entitled to charge 4 per cent. on the annual value of the premises supplied with water, unless the premises are beyond 160 feet above Trinity high-water mark, when they are authorized to charge 5 per cent. on the annual value.

Mr. Kershaw, the surveyor to the Company, and Mr. Smith, the foreman, gave evidence of the height of the cistern being above 160 feet higher than Trinity high-water mark, taking the level mark on the Congregational Church as appeared on the Ordnance map.

On the part of the defendant, Francis Dodd, clerk to defendant's solicitor, and father-in-law of defendant, who said he was very proficient in taking levels, described the cistern as not being above 160 feet, taking the measurement from the doorstep, and deducting the two feet drop inside the house.

His Honour decided that the height must be measured from the mark on the Ordnance map.

Judgment for the Company for the amount claimed.

THURSDAY, JAN. 24.

NEW RIVER COMPANY v. PROUT.

This was a claim made by the New River Company against William Prout, of Colney Hatch, builder, to recover the sum of £3 for water supplied to defendant during the building of four houses in Station Road, Colney Hatch.

Mr. DEBENHAM, solicitor, who appeared for the Company, stated that the water was taken by defendant for building purposes, without any previous notice having been given to the Company, by which, under the Act of 1852, section 40, he could have been taken before the Magistrate, and a penalty of £10 inflicted; but the Company preferred taking the present proceedings for the recovery of the money.

George Melton, foreman to the Company for the Colney Hatch district, stated that in November, 1876, and again in the course of 1877, he saw four houses in course of erection in Station Road, Colney Hatch. He saw men at work on the building take water from a cistern of the house occupied by defendant, to which house, water was supplied for domestic purposes only. The water was taken from the cistern by means of a syphon-pipe. He spoke to the foreman bricklayer on the subject, and on another occasion, in the year 1877, he saw water taken in the same way.

James Cassey, collector to the Company, stated that he first applied to defendant for £6 for water supplied to him. The charge for a £900 house was £1 10s., the four houses making £6; but on defendant stating he had taken the water from a pit on the premises, the charge was reduced one-half.

Defendant said he was the owner of a great many houses at Colney Hatch, which he had built, and had never applied for, nor required any, water from the Company. He never gave his men any orders to take water from the cistern. When water was wanted, he told his men to sink a tub on the premises, and get it from the land drain. On his own premises he had water enough to build above one hundred houses.

His Honour thought the Company had not made out their case, and non-suited them.

WEYMOUTH POLICE COURT.—TUESDAY, JAN. 15.

(Before Messrs. TALBOT, DREW, and MILLEDGE.)

INTIMIDATION OF GAS WORKMEN.

Samuel Symes was summoned, at the instance of the Weymouth Gas Company, "for that he wrongfully and without legal authority, and with a view to compel one John Barrett to abstain from his trade or calling as a gas stoker, did use intimidation towards the said John Barrett, and persistently follow him from place to place and watch and beset the house where the said John Barrett resides or works."

Mr. HANNE, who appeared for the prosecution, said he was happy to state that this was the first case of the kind which had come before the Bench under the Act of Parliament which authorized the present proceedings. The Magistrates were aware that an Act was passed in 1867, called the Masters and Servants Act; there was also a subsequent Act passed in 1871. But these proceedings were instituted under an Act passed in 1875, called the Conspiracy and Protection of Property Act. For some time previous to the passing of that Act, a considerable agitation had been kept

up in the country, in reference to trade disputes and trade unions, and this Act was passed to meet it, a special provision being inserted for the protection of gas and water companies. The 4th section of the Act provided that where a person employed by a municipal authority, or by any company or contractor upon whom is imposed by Act of Parliament the duty, or who have otherwise assumed the duty of supplying any city, borough, town, or place, or any part thereof, with gas or water, wilfully and maliciously breaks a contract of service with that authority, or company, or contractor, knowing or having reasonable cause to believe that the probable consequences of his so doing, either alone or in combination with others, will be to deprive the inhabitants of that city, borough, town, place, or part, wholly or to a great extent of their supply of gas or water, he shall on conviction thereof by a court of summary jurisdiction, or on indictment in the manner mentioned, be liable either to pay a penalty not exceeding twenty pounds, or to be imprisoned for a term not exceeding three months, with or without hard labour. He thought it was well to let people who were in the employ of either gas or water companies know the law which bound them to their employers. He would now refer to the section under which the present charge was made, but would at once say that if Mr. George, who appeared for the defence, wished to object to the jurisdiction of the Court, the 9th section allowed him to do so, although he scarcely thought he (Mr. George) would take advantage of it.

Mr. GEORGE said he wished this case, as well as the one which was to follow, to be tried here.

Mr. HANNE said the section under which he was now proceeding was the 7th, and it was as follows:—"Every person who, with a view to compel any other person to abstain from doing or to do any act which such other person has a legal right to do, or abstain from doing, wrongfully, and without legal authority, uses violence to or intimidates such other person, or his wife or children, or injures his property, or persistently follows such other person about from place to place, or hides any tools, clothes, or other property owned or used by such other person, or deprives him of or hinders him in the use thereof, or watches or besets the house or other place where such other person resides or works, or carries on business, or happens to be, or the approach to such house or place, or follows such other person with two or more other persons in a disorderly manner in or through any street or road, shall, on conviction thereof by a court of summary jurisdiction, or on indictment as hereinafter mentioned, be liable either to pay a penalty not exceeding £20, or to be imprisoned for a term not exceeding three months, with or without hard labour." The question in this case was, Did the defendant intimidate one John Barrett with the view of compelling him from carrying out the contract which was in existence between him and the Gas Company? If the Bench thought he had so intimidated him, then he must ask them to inflict such punishment, either by fine or imprisonment, as would teach him and others they had no right to make use of such language. It appeared there were eight men in the employ of the Gas Company, who had been engaged there at work for a considerable period, but lately had been working under a sliding scale. They were paid so much per week according to the amount of gas they made. They were under a weekly hiring, and exercised their discretion by giving the Manager of the Company notice to leave. One portion of the gang left work at half-past five on the following Friday afternoon, and the other at half-past five the next morning. These men constituted the principal staff of the Gas Company, and, inasmuch as they left work on Saturday morning, there were only yardmen on the premises to whom the Manager could look for the supply of gas to the town for Saturday night and Sunday's consumption. In consequence of this Mr. Stone had to take necessary and active steps, telegraphing to some friends of his who were gas managers, as also to some persons with whom he was acquainted in Wales, for men. From various sources he had five sent; but they were inexperienced workmen, and if he had not taken the trouble, and been to the expense of £20, the town would have been in a state of utter darkness at night on the Saturday and Sunday, and the early part of the next week. Amongst other men he obtained eight from Wales, and these were under an engagement to come on Saturday morning at the time when the last men left the works. The first portion of these men came to work; but they had not been on the premises about an hour or so before some of the old hands, seeing the Manager's back turned, came into the gas-works and told the strangers, in the presence of the foreman, they were on strike. Upon hearing this the Welshmen dropped their tools and left work, and the consequence was all the trouble which had been taken by the Manager proved abortive, and he was thrown on his beam-ends, as the news was conveyed to the other four, and they never put in an appearance at all. Mr. Stone had, therefore, to get up a scratch staff, and, of course, a raw hand was not so competent to carry out the manufacture of gas as a person was who had got his hand into the work. He (Mr. Hanne) was bound to say, because it was to the credit of four men out of the eight who had been in the employ of the Gas Company, they recanted and came back, in consequence of overtures made to them. One of these was Barrett. Symes and Ryder, who were the ringleaders, as soon as they found the other four men had not stuck to their colours, beset them, calling them all kinds of foul names, even going so far as threatening to kill them. Barrett went to work on the Sunday morning at six o'clock, thus showing he very soon regretted the foolish step he had taken. When he was going home he saw the defendant and some other men standing at the bottom of Boot Lane. Naturally enough they got into conversation, the topic being about his (Barrett's) going to work. Symes then called him most foul names; and the question for the Bench to decide was whether the threats then made use of were with the view of intimidating him from carrying out his contract. If they thought so, he would ask them to inflict such a penalty as they might think fit, but not less than £5.

Barrett was then called as a witness, but declined to be sworn and give evidence, until informed by the Bench that, if he persisted in his refusal, he would be committed to Dorchester Gaol for seven days, with hard labour. Even then his evidence was given reluctantly. He said: I have worked for the Gas Company, off and on, for eight years. On Saturday morning, at half-past five, I left the Company, in consequence of my having given a week's notice to do so. I was one of the night hands. Four stokers left the works the evening previously, and three others the same time as I did. Symes was in my gang. After I left on Saturday, Mr. Stone sent to me, asking me to come back to work, and I agreed with Palmer, Ozzard, and Berry to do so on Sunday, on certain conditions. Previous to going back to work we all swore on Saturday, saying we would not go back unless we had 28s. a week. For the last three or four weeks we had been paid £1 4s. 6d. a week, the lowest scale being £1 0s. 9d. When I say "we swore," I mean the whole of the eight men who had left the works. The four of us did not agree to resume our work until Saturday night. I did not go to the other four men and tell them of our resuming work. I went to work on Sunday morning, at six o'clock, and remained there until breakfast time. The terms I went back to work on were standing wages of 24s. a week and an extra man. On my way to breakfast on Sunday morning I saw Symes and Ryder. I paid Symes a shilling which Palmer owed him. I do not know the reason why he asked me to do so. I am not aware I have stated to any one the reason why Palmer asked me to pay the shilling. I do not know I have told Mr. Stone the reason why



Palmer would not pay the shilling—whether it was because he was afraid to do so or not. I spoke to Symes first, saying, "Here's a shilling Palmer owes you." He took it, and thanked me. He then asked how it was I had gone to work—how it was I had not stuck to my colours. I told him I had spoken for all hands; but Mr. Stone said he would rather sacrifice both legs and arms than take either of the other four back again. Symes replied, "You know you agreed not to go back unless you had 28s. a week." He called me a sneaking, undermining —, and said I should not live long if he could do it. He never mentioned my name, but included all in the remarks.

Cross-examined by Mr. GEORGE: The words which Symes used did not prevent me going back to work. His words did not frighten or intimidate me in the least from going back to work. I am as bad as the rest of the men, as I had made use of threats on Saturday to any one in the gang who went back without the others.

Re-examined by Mr. HANNE: What I mean by saying I am as bad as the others is, because I threatened. I told Mr. Stone I was compelled to be as bad as the others. If I had known it was coming to this I would not have gone back again. I do not believe Symes meant what he said. I said things on Saturday which I did not mean, and I believe he did the same. He was not drunk at the time.

By Mr. ARDEN: I went to work again after breakfast on Sunday, and worked till six o'clock at night, and am still at work. When I went home last night, I said, "I do not think I shall go out again."

Mr. GEORGE asked the Bench if they thought there was sufficient evidence to convict. He contended the case of intimidation had not been made out. These eight men agreed to strike unless they had higher wages, and when Symes met Barrett on Sunday, and found he had gone to work, they had one or two words; but the latter had told them these had not had the slightest effect on him, so as to prevent his going back to work. Was there, then, sufficient evidence to convict the defendant under this penal clause? He submitted there was not. There was no doubt words were used in the heat of the moment; but the Magistrates must be fully satisfied the defendant had so intimidated the other man as to make him really afraid to go back to work. He went back, was there now, and under these circumstances he (Mr. George) asked them to dismiss the case.

Mr. HANNE said he thought Mr. George had been endeavouring to twist the words of the Act of Parliament. The Act did not say the threats should prevent a man from going back to work, but when they were made with that view. That was the question for the Magistrates to interpret.

Mr. TALBOT, in giving the decision of the Bench, said the Magistrates had considered the case presented to them against the defendant, and were of opinion that it had been clearly proved. The defendant had been guilty of a very gross act, and they were astonished that he should have done it. It was not as though he was underpaid; the fact was he had good wages, and ought to have been satisfied. Anything like intimidation of fellow-workmen could not be tolerated. The defendant was liable to three months imprisonment and hard labour, or a fine of £20; but the Bench were disposed to reduce the penalty as much as possible, hoping that the conviction would be a warning to defendant as well as to others. They, therefore, fined him £5, or in default 21 days imprisonment.

Mr. DREW added: In this country every man is at liberty to make a bargain for his own labour, and no other man must interfere with him.

George Ryder was summoned, at the instance of the Gas Company, for using violence and intimidation towards Charles Watson on the 14th inst.

Mr. HANNE said in this case, in addition to using intimidation, actual violence was resorted to. The complainant was a perfect stranger to the town, a sailor by trade, who, being shipwrecked down Channel, made his way from Plymouth to Weymouth, and being only too anxious to get any employment whatever, he was engaged by Mr. Stone, the Manager of the Gas-Works.

Complainant: I have been for 15 years a sailor. I was shipwrecked off Falmouth, but made my way to Weymouth, where I got employment at the gas-works as a stoker. I was to have 24s. 6d. a week. I commenced work on Saturday night. On returning from breakfast yesterday morning to the gas-works I was about to walk across the new embankment, when I saw four men standing near the corner. One of them came up and said, "You are one of the — working over there," at the same time pointing to the works. I made no answer, and he up with his fist and struck me under the chin, saying he would knock my brains out. He also said, "All you — had better look out to-night, as you'll have very little longer to live." I am a perfect stranger to the town. I cannot identify the man who struck me out of the four.

Mr. HANNE said that being so the case must fall.

Mr. GEORGE remarked he was instructed to deny his client either struck complainant or intimidated him in the least.

Mr. HANNE wished to say, on behalf of the Gas Company, they were bound to supply the town with gas. These proceedings were not taken out of any ill-feeling towards the men, but to show the public generally, and more particularly the working men of the town, that, in justice to themselves as a company, and also to gas consumers, they were compelled to do so.

Mr. DREW (to Ryder): If you think your services are worth 28s. per week, you are perfectly justified in asking for it, but you must not interfere with a man who is ready to work for 24s. If that man has a wife and family to keep, he must be protected and not annoyed.

Defendant: I never spoke to him.

Mr. DREW: You must not interfere with men who will offer their labour at the best market; they are perfectly justified in doing so, and the Magistrates will protect them. At the same time, you have as much right to get what you can for yourself.

Mr. HANNE: I should like the Bench to give some expression as to what would be done in any future case, as I am afraid the matter has not ended.

Mr. TALBOT: The Bench wish it to be known, and to be made use of amongst your fellow-labourers, that in every other case which is brought before them of this kind they will punish as far as they possibly can, because it is an unlawful proceeding. You have as much right as others to get what you can for your labour, but not to intimidate others.

TRANSFER OF THE RAMSGATE GAS AND WATER WORKS TO THE LOCAL BOARD.—At a special meeting of the Local Board, held, in committee, on the 23rd inst., the seal was affixed to the deed of security to the Bank of England for the loan of £155,000; after which the necessary formalities connected with the transfer of the gas and water undertakings to the town were duly gone through. At a meeting of the Board of Directors of the Ramsgate Gas and Water Companies on Wednesday last, the following sums were stated as the prices at which the above undertakings are to be transferred to the Local Board:—Gas-Works, £70,052 19s.; Water-Works, £70,436 18s. 7d. The Local Board have appointed a Gas and Water Committee, consisting of seven members, who are empowered to do all acts on behalf of the Board which the Board can lawfully do under the provisions of the Ramsgate Local Board Act, 1877, except the borrowing of moneys and the making of rates.

## Miscellaneous News.

### METROPOLIS WATER SUPPLY. MEETING OF DELEGATES.

On Friday afternoon last, a meeting of delegates from Vestries and District Boards of the Metropolis was held at the offices of the National Chamber of Trade, in the Strand, to take into consideration the proposals of the Metropolitan Board of Works to assume the property of the several Water Companies, and further create a second supply, by means of a separate service. Mr. R. ATTENBOROUGH, Chairman of the Executive of the London Water Supply Committee, presided, and there were delegates present from St. Martin's-in-the-Fields, Kensington, Bethnal Green, St. James's, Westminster, Bishopsgate, Hammersmith, Southwark, Marylebone, &c.

The CHAIRMAN, in opening the proceedings, stated that the meeting had been summoned without much notice, but the fact was that there was not much time, if they were to have a *locus standi*. As delegates from Vestries (just as much so as were the members of the Metropolitan Board) they felt it necessary that there should be some control exercised from outside on the members of that Board, some of whom were Shareholders in the Water Companies, while the magnitude of the interests involved in the question should be impressed on them. On the subject of the purchase of the Companies, a short general resolution would be submitted; but they would not go into details, as there was room for a vast difference of opinion on such a large and comprehensive scheme. What was wanted, therefore, was to start on a general definite basis, and then at future meetings to decide what they were to do, to further the promotion of the scheme so far as they approved of it. He believed it would be to the advantage of the ratepayers that the whole of the property of the Water Companies should be in the hands of one public body not interested in obtaining a profit on the outlay, but chiefly interested in seeing that the consumers had a pure and wholesome supply of water at as moderate a price as could be afforded. That, he thought, was the main principle of that meeting, which he might consider as representing the ratepayers pure and simple. The St. Pancras Vestry had opposed the whole scheme, which he thought was wrong. With regard to the second scheme of a new supply, he thought that, however, was not necessary. It would be enormously expensive; it could not be done for £5,500,000. He was told that it was perfectly impossible to get water from the chalk, or, if it could be obtained, the supply would be intermittent, and would probably fail. He moved the first resolution, as follows:—"That in the opinion of this meeting it would be to the interests of the Ratepayers and Consumers that the interests in the various Water Companies became the property of the Board of Works."

Mr. E. J. WATHERSTON seconded the resolution.

Mr. BEAL said it must be understood that the Vestries were represented by the Metropolitan Board, and could not be separately heard by counsel, before a committee of the House of Commons, in opposition to the Board. He recommended the meeting to pass a resolution condemnatory of the Additional Supply Bill, and that, instead of buying up the whole of the existing Companies, the purchase should be limited to a few—such as the New River, the Kent, and the East London—so as to learn something as to the mode of proceeding. He was of opinion that the Board should purchase only a portion, as some Companies were acting in contravention of the Acts of Parliament as to giving a pure supply. Whatever was the cost of making a supply pure ought to be charged against the Companies.

Mr. LIGGINS stated that his Vestry had not had time to consider the matter. He spoke against the second scheme, as based altogether on erroneous foundations.

Mr. BONTHEON said the first scheme was quite large enough to deal with, and deprecated any discussion on the second. Even the first scheme was so crudely got up that he could only vote for affirming that it was right in principle.

Captain BERKELEY said the delegates must not be alarmed at the figures which appeared to be involved. It was a mere transfer of the undertakings from one body to another, and the ratepayers would have to find the interest, and not the capital, of the sums named.

Mr. DANIEL, in supporting the motion, said the delegates need not be frightened by the reported fabulous prices the Companies were going to ask for their rights, as that would be settled by a committee of the House of Commons.

On the question being put, there appeared to be only one dissentient; but several present refrained from voting, on the ground that their Vestries had not had time to consider the matter, so that they had no authorization.

The CHAIRMAN said he thought it would be better, under the circumstances, to adjourn the meeting for a fortnight, and it was suggested that a copy of the resolution should be forwarded to each body for consideration.

Mr. BONTHEON thought there should be an expression of opinion on the second scheme, in which observation others concurred.

After some conversation, it was agreed that another resolution upon the second scheme should be submitted, and that both resolutions should stand in abeyance, to come up at the adjourned meeting, when, having been considered in the meantime, by the different Vestries and District Boards, before whom they would be laid for consideration, they would be decided upon. The resolution was as follows:—"That the scheme set forth in the Metropolitan Water Supply Bill is premature, and that it should not be proceeded with at present." This and the previous one were left to stand over till the adjourned meeting, on Friday week, so that time would be allowed for deliberating upon them.

A vote of thanks to the Chairman brought the proceedings to a close.

The Executive London Water Supply Committee have issued a circular, addressed to the Metropolitan Vestries and District Boards, in which they state that it appears to them that "an exceptional occasion has arisen for the united and vigilant action of the Local Governing Bodies of the Metropolis. They beg leave to point out that it is currently reported that the united claims for the purchase of the Water Companies are computed at £25,000,000, being more than double their estimated value in 1865—viz., £12,000,000; and more than four times that originally mooted before Sir James Graham's Committee in 1851—viz., £6,000,000. The demand for such a stupendous sum alone suggests the most careful attention; but, added to this, the scheme for creating a second supply for domestic purposes, and a constant high-pressure service, will, it is said, cost a further sum of £5,500,000. Thus it appears as a starting-point that the present inflated income of the Water Companies (about £1,300,000) would not be sufficient to pay the interest upon the capital outlay, and the costs of maintenance and management of the works; consequently an additional burden would be placed upon the rates, instead of the relief anticipated last year. Looking at these facts, without taking into consideration the further large individual expenditure thrown upon the Ratepayers by the 16th clause of the Metropolis Water Supply Bill, it behoves the Committee to strongly recommend united action on the part of the Local Authorities, in guarding the Ratepayers against the expenditure of so immense a sum, without most carefully and jealously watching the progress of these



measures. They would further beg leave to impress upon your Board the fact that many members of the Metropolitan Board of Works are shareholders in the Water Companies; and although they do not infer that this circumstance would influence them in the performance of their public duties, yet the Committee feel justified in adding that circumstance as another important reason for combined active vigilance."

#### ST. PANCRAS VESTRY.

The following is the Petition presented to the House of Commons by Sir Thomas Chambers, Q.C., on Monday the 24th, from the Vestry of St. Pancras:—

*To the Honourable the Commons of the United Kingdom of Great Britain and Ireland in Parliament Assembled.*

The Humble Petition of the Vestry of the Parish of St. Pancras, in the County of Middlesex, under its Common Seal, sheweth—

1. That the Metropolitan Board of Works have resolved to lay before your Honourable House two Bills relating to the Supply of Water to the Metropolis, one to empower the Board to purchase the present Water Companies undertakings, and the other to empower it to give a new and additional supply of water for potable, fire-extinguishing, and other purposes.

2. That your petitioners are constituted by the Metropolis Local Management Act, 1855, and other Acts, the authority for sewerage, sanitary, paving, lighting, and other purposes in the parish aforesaid.

3. That the parish under the management of your petitioners is one of the largest in the Metropolis, containing about 25,000 inhabited houses, and a population of nearly 250,000 persons, and that the property therein is assessed at more than £1,300,000.

4. That your petitioners have strong objections to both the proposals of the Metropolitan Board of Works, believing them to be uncalled for and unnecessary, and likely to entail upon the inhabitants of this parish, in common with those of the Metropolis at large, increased pecuniary charges, without any corresponding benefit.

5. That the parish represented by your petitioners is supplied with water by the New River and West Middlesex Companies, and that your petitioners have no complaint to make of the quality or quantity of the water supplied. That the reports of Dr. Frankland, the Government Analyst, to the Local Government Board, show that the water is well purified and wholesome, and in particular his report, dated the 3rd of November, 1877, speaks of the river water supplied by the London Water Companies as "on the average equal in chemical purity to deep well water."

6. That your petitioners see no reason to anticipate that, if the Companies undertakings were acquired by the Metropolitan Board, there would be any reduction of cost to the consumers, or any essential improvement in the quantity or quality of the present supply. That the saving of expense of management, in the shape of Directors fees, &c., would be of trifling amount as compared with the total annual expenditure, and would be much more than counterbalanced by the increased expenditure in other directions, which would be sure to follow the transfer (experience showing that undertakings of this kind are economically managed by those whose profits depend upon their good management) and, moreover, the interests of the public are at present amply secured by the constant examination of the water by Government Officers, and the public audit of the Companies accounts.

7. That the debt of the Metropolitan Board is already very large, and is constantly increasing, Acts of Parliament passed in the year 1877 alone, having imposed work upon the Board, in the shape of freeing bridges, making new streets, and clearing unhealthy areas for working-class buildings, which will increase the debt by several millions.

8. That the purchase of all the Metropolitan Water undertakings would further increase the debt by an amount variously estimated at from 25 to 35 millions, to say nothing of the cost of the new supply, and that in the event of a new source of supply being adopted at some future time, the whole of this enormous sum would become a dead weight on the Metropolitan ratepayers.

9. For the above reasons your petitioners earnestly hope that power will not be given to the Metropolitan Board to purchase the undertakings of the Metropolitan Water Companies.

10. Your petitioners also strongly object to the scheme for a new supply of water for drinking, and for putting out fires, on the following grounds:—

11. That it is unnecessary for drinking purposes, because the water now supplied is good and wholesome, as instanced by Dr. Frankland's report before referred to—and the Royal Commissioners on Water Supply, in their report in the year 1869, after making a thorough and exhaustive investigation into the whole subject, came to the following conclusion:—

"That there is no evidence to lead us to believe that the water now supplied by the Companies is not generally good and wholesome, and, when efficient measures are adopted for ensuring perfect filtration, water taken from the present sources will be perfectly wholesome, and of suitable quality for the supply of the Metropolis."

12. That a totally new supply is not required for the extinction of fires, inasmuch as, in the City of London and other places where hydrants have been fixed and tried, in the districts of the New River and Kent Water Companies (on the constant supply system), water can now be thrown by the simple pressure in the pipes to a height sufficient to extinguish fires in lofty buildings, and such water being supplied by the Companies free of charge.

13. That in addition to the great and needless cost (estimated at 5½ millions, exclusive of the cost of management) of the new system, serious inconvenience and annoyance would result to the public from the necessity of taking up every street in the Metropolis to lay down an additional series of pipes under the footways of each side of such streets, and having to enter every house for the purpose of bringing the new water into it, and this inconvenience would be felt by every householder, and, indeed, every inhabitant of London.

14. That when the new water supply is brought into houses, side by side with the existing water, it will be quite impossible to secure that every householder shall observe the distinction between the two kinds of water, so that the new water shall always be used for drinking and cooking, and for those purposes alone, and the present water for all other domestic purposes. That besides the poor and ignorant householders who cannot be expected to observe the distinction, the rich and well-to-do are so much in the hands of their servants in these matters, that they can have little or no security that the distinction will be always observed in their houses, and, if it be not, the new supply will be practically valueless, and the money spent on it will be thrown away.

15. Your petitioners believe that the generality of London householders are quite unaware of what it is intended to impose upon them, and of the increased rates and the inconvenience and difficulties which will follow, and that, if they were aware of it, there would be a "loud outcry against the measures."

Your petitioners, therefore, humbly pray your Honourable House that the Bills of the Metropolitan Board of Works in relation to the

Water Supply of the Metropolis, may not pass into law, and that your petitioners may be heard by themselves, and by their counsel, agents, and witnesses, before any Committee to which the said Bills may be referred, in support of the allegations of this petition, and against the said Bills, and that your petitioners may have such other relief as to your Honourable House may seem meet.

And your petitioners will ever pray, &c.

**STRAND DISTRICT BOARD.**—A communication has been addressed by this Board to the Metropolitan Board, intimating that "while approving generally of the policy of the Metropolitan Board in its desire to obtain the necessary power to acquire the interests of the Water Companies of the Metropolis, they condemn the project of the Engineers, which contemplates laying down a double water supply at an enormous addition to the Metropolitan rates. That this Board consider that no further action beyond the purchase of the Water Companies should be taken by the Metropolitan Board of Works until they have become the authority for the supply of water to the Metropolis, and have found that the large powers now existing in the various Acts of Parliament, for the purification of the river and the improvement of the supply, are insufficient, and that a double supply is urgently required."

Major Bolton reports that the state of the water in the Thames and Lea was generally turbid and discoloured during the month of December last. Of the Companies drawing their supplies from the Thames, the West Middlesex, East London, Chelsea, and Lambeth have sufficient storage capacity and impounding reservoirs to avoid taking in water when floods prevail, the Southwark and Vauxhall, and Grand Junction Companies, on the other hand, are not so circumstanced, but have acquired land for the construction of suitable storage reservoirs and other works at Hampton. The water in the River Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated) was turbid on the 1st of December, but improved in clearness about the 6th; it then became worse, and on the 10th was very turbid; from that date it improved, and remained good up to the 29th; after which it again became coloured, and remained in a turbid condition until the end of the month. The highest flood state of the river at Hampton during the month was 2 feet 8 inches above summer level, and the lowest one inch above summer level.

#### MANCHESTER WATER SUPPLY.

##### THE THIRLMERE SCHEME.

On Monday, Jan. 21, at a Meeting in London of the National Health Society, held under the presidency of Mr. ERNEST HART, a deputation, headed by Mr. Somervell, attended from the Thirlmere Defence Committee, to seek the aid of the Society in opposing the scheme, which proposes to enable the Corporation of Manchester to purchase the valley of Thirlmere, with its surrounding mountain slopes, in the whole 11,000 acres, to construct a reservoir on the site of the present lake, capable of affording a constant supply of 50 million gallons of water daily. It was stated that the grounds of the opposition were that the natural beauties of the lake scenery are in themselves as important medicinal agents to the overworked as pure water itself, that more suitable sources exist, and that, even if they did not, the quantity proposed to be taken is in excess of the actual requirement. The city of Manchester, on the security of whose rates the requisite capital is to be borrowed, is under statutory obligations to supply a surrounding population of 800,000 persons. If population increases as of late, the numbers may possibly amount to a million fifteen years hence. The 800,000 are now abundantly provided for by the distribution of about 17 million gallons or 21 gallons a head per day. Yet the Corporation, having already this supply, propose to go into Cumberland, to a spot 100 miles distant, and there take possession of a further supply, which will give them 75 million gallons daily. It was further alleged that there existed vast elevated moorlands, drained by the River Lune, and extending from Lancaster to Tebay, on the Carlisle Railway, which region is practically unoccupied for such purposes; there are copious sources of underground supply, and the rainfall is above that of England generally. The Thirlmere Committee proposed asking the Home Secretary to receive a deputation on the subject.

The CHAIRMAN, in answer to questions, said it was proposed to obtain an inquiry into the whole question of Lancashire water supply by a Royal Commission or Select Committee of the House of Commons, where others beside the owners of the lands at Thirlmere would have a *locus standi*, instead of permitting a powerful Corporation to carry their Bill through a private Committee, before which no representation of what would be known as public interests could be made. He characterized the scheme as a merely financial one.

After some discussion, a resolution was passed binding the Society to assist the Thirlmere Committee in obtaining a full parliamentary inquiry.

On Thursday, Jan. 24, a deputation from the Corporation of the City of Manchester had an interview with the Right Hon. G. Solater-Booth, at the Local Government Board, with reference to the Bill now before Parliament, promoted by the Corporation, for securing an increased supply of water from Lake Thirlmere.

The deputation consisted of Sir Thomas Bazley, M.P., Mr. Hugh Birley, M.P., Mr. Hibbert, M.P., Mr. Jacob Bright, M.P., Mr. Hardcastle, M.P., Mr. Isaac Fletcher, M.P., Mr. Benjamin Whitworth, M.P., the Mayor (Alderman Grundy), Alderman Grave, Alderman Patteson, Alderman Bennett, Mr. George Booth, Mr. Bateman, C.E., Mr. Hill, C.E., Mr. Talbot (Deputy Town Clerk), and Mr. Berry (Water-Works Superintendent).

The PRESIDENT announced that Mr. Cross, the Home Secretary, was unable to be present, owing to unavoidable engagements elsewhere.

Mr. BIRLEY, M.P., introduced the deputation, and, in doing so, said the principal object was to obtain the sanction and support of the Government to the second reading of the Bill, so that it might not be thrown out on side issues or insufficient reasons in the House of Commons, but that it might go free and untrammelled before a Select Committee for the most thorough and complete examination. The one thing they had to fear and deal with was the sentimental question, the powerful effect of which was likely to be considerable on those Members inside and outside the House unacquainted with the matter. There might be an objection made that the scheme was unnecessary, that Manchester was able to supply herself with water without having recourse to Thirlmere Lake; while the other objection was that the Manchester Corporation were in the habit of providing both manufacturers and private houses beyond the limits of the borough with water. If that objection existed at all it ought to be removed as speedily as possible. Those persons who lived in the suburbs were practically themselves citizens of Manchester, and it was now becoming impossible to supply those parts with water, except by artificial means; but neither the Local Boards throughout the country nor the Local Government Board would desire that the supply of water by artificial means should be thrown upon a single board; the cost would be too enormous, and the people of Manchester were perfectly satisfied to take over



present arrangements, and to carry them out perfectly. The population was growing enormously, and the Corporation were anxious, giving heed—looking ahead—to what might be wanted in the course of ten years.

The MAYOR of MANCHESTER (Alderman Grundy) observed that they sought that interview to state the position they, as a Corporation, stood in with reference to the projected Thirlmere water scheme. The point to which they wished to direct attention was an extremely simple one. In Manchester the Corporation had had very extensive water-works, and they had had credit given to them throughout the country for the foresight they had shown in the provision of those water-works; and they were such as, generally speaking, from the tone of the public upon the engineering skill displayed, reflected credit upon the Corporation for the good services done. But it was now between 30 and 40 years since those water-works were projected, and from that time not only had the population of the city greatly increased, but large claims had been made upon them from outside districts, because many of those districts were under local boards, and were not able, either financially or from a geographical point of view, to provide any water-works of their own. Therefore, the claims of the surrounding districts, which Manchester had had to meet, were very great. To show the extent to which those demands had grown upon them, he stated that the yearly increase of consumption amounted to 750 million gallons on the average each year. That pointed to the conclusion that their present supply would very speedily be exhausted, as they had only a certain circumscribed area of rainfall, and stated pretty accurately how long present means would last. They were told by their engineers, and confirmed by various experiments, that about six or seven years from the present time would see them at the end of their tether as regarded their supply. It would be, therefore, understood that the Corporation, as representing a large community, feeling that they had the supply of water to provide for no less than 800,000 individuals—the city proper and surrounding districts—naturally felt that a great amount of responsibility attached to them. They tried to forecast the wants of the community, but in water-works it was particularly incumbent on them to look ahead, because such things could not be accomplished in a few days, especially works of that extent, or of any extent, for the wants of such a community. It was estimated that no water could be available from the new source under ten years from the commencement of the alterations. The demand would have overtaken their supply before they could utilize the new source. They did not pretend to say that they were in want at the present moment, but they maintained that they would want before they could obtain supplies from the present source. With reference to the scheme itself, they knew the cost and every detail, having had Bills before passing through Parliament. They had prepared in the past, at great cost, plans, specifications, calculations, and everything of an elaborate kind, to enable them to go before a parliamentary committee to make a case clear, and they were not ignorant of what the present scheme involved. There was now on the books of the House a motion to be made by Mr. Howard, of Cumberland, which might be characterized as an insidious motion, and one which undoubtedly aimed at the Thirlmere scheme, although the name of Thirlmere did not occur in the notice. They knew that it aimed at their proposal, and they wished to represent to the Government that they had prepared themselves, at great outlay, to go before the Committee of the House, where they were prepared to enter upon the merits of the scheme, and meet every possible objection that could be urged against them. They ventured to say that those of the Thirlmere Defence Association, who were opposing the scheme, were not prepared to meet the scheme on its merits. He asked, what possible evidence could be brought before the proper tribunal that would be valuable evidence respecting the supply of water to such a town? Who could get up the evidence against such a scheme? It would be useless; and they thought that if the Government lent its sanction to such a proposal it would take upon itself great responsibilities. Was the Government ready to undertake the supply of all the populous places in the North with water? Was it proposed to destroy the zeal of the Corporation in the matter? On the contrary, was it not the object of the Government to encourage them? They asked the President to allow them to use his influence and that of the Government in saying that an important question like that was not to be disposed of by a side wind such as Mr. Howard's motion was. Representing an important community, they knew what they were about; they had obtained the best scientific knowledge the country could provide, and they asked to be heard what they had to say on the subject.

Mr. BATEMAN, C.E., said that to a great extent he was responsible for the Manchester Corporation being now before Parliament, because, as their adviser for 30 or 40 years, and the engineer of the works already carried out, he felt it his duty from time to time to look into their means of supply, and he found that in 1855 the quantity of water taken into the town of Manchester and the district the Corporation had had to supply when they purchased the old Manchester and Salford Water-Works was 8 million gallons per day; but now, 20 years later on, it was 18 million gallons per day, so that the consumption had increased 10 million gallons per day in the course of about 20 years. Seven hundred and fifty thousand gallons per day was some time since the increase, but the average of the last two years was 1,200,000 gallons per day. If the prosperity of Manchester was to continue, they would require at the least 1 million per day more. It was going on at that rate some years ago, when he brought the subject before the Water Committee of the Corporation; but by great economy at the outset, by house-to-house visitation, and other means, the waste was reduced, and had not been 1 million gallons a day since that time, but only 750,000 gallons. He believed, however, that no further reduction could take place by economizing supplies. It must be considered that the inhabitants of Manchester were a flower-growing or garden-loving people, who carried on their business within the city and lived on the outskirts. Those who lived in the suburbs were quite as much residents of Manchester as those carrying on business in the town itself. But to gratify their tastes, which were of a horticultural character, they used a considerable quantity of water; so that the wants of the inhabitants, independent of their domestic and trade wants, were greater than those of most towns. The present consumption was about 18 million gallons per day, but in years of extreme seasons—of cold or drought, or intense heat or cold—the consumption would run to 21 millions per diem. But if the yearly increase went on at the rate of 1 million gallons per day, in six years they would come to the full extent of the quantity of water they had to supply. The result would be almost a water famine, so that without the new supply the prosperity of the town would be crippled, and the manufactories now existing could not go on. With regard to other districts from which water could be obtained, it was found that almost every district where water was available was appropriated already. When, forty years ago, he recommended the Corporation to go to the Valley of Coverdale for water, that was because it was so situated that additional supplies could be brought from the south to the north. Since then the prosperity of the public had not been confined to Manchester, but had extended to other towns, which had appropriated to themselves other sites which he thought, thirty years ago, the Corporation might have looked to go to. On imperial and national grounds, in his opinion—and others who had considered the subject felt the same—no near gathering-ground ought

to be taken by any large community which could afford to go to a longer distance. Liverpool went to the Preston and Bolton and other hills, which they completely sucked, and the result was that Preston, Blackburn, and other places had been obliged to go to much greater distances than they would if they had been left alone to that district for their supply. Only last year Blackburn went up to the sources of the Hodder to get its supplies, and a few years ago Preston had gone to the same district; and so it had happened that almost every near place had been appropriated, or ought to be, and would be required by the populations who lie near to them. Under such circumstances, when a large quantity of water had to be obtained for Manchester, with a community of 800,000 persons within their limits of supply, they felt that they must go that distance to which no other town could go. Besides, no other district would yield the quantity of water which they would require, and if they had to go, as they must, for the great quantity of water they required, they must expend a large sum of money, and they ought to make provision for a great many years to come, and as the nearest place for that supply was Thirlmere Lake, there, by his advice, they had gone. It was proposed to raise the water some 50 feet, and not drive it down from its present level; and, inasmuch as the site would yield 50 million gallons of water per day to the public, in addition to the compensation which would have to be given to the streams from which the water was taken, the variation in the level of the lake between high and low water would be 8 or 9 feet, and if they drew 20 million gallons per day—which the present generation would not see, and would not, perhaps, be alive to see—the variation in the surface would not be as great as the variation in the surface was now; so that the broad margin of mud which the sentimental opponents of the scheme talked about, really existed only in their imaginations, or the misrepresentation of those who did not understand the question. It would not be until 40 or 50 years had elapsed that the whole quantity of water might be expected to be obtained, and then any drought must last some 135 days, before the water could be drawn down to the present level of the lake. The average rainfall during 10 months of last year was 98 inches, and the water at present ran away absolutely useless. There were very many factories there, and those that did exist would be much benefited by having a larger supply than they now had, and the damage from floods would be lessened. There was only one resident on the lake, Mr. Leathes, of Dayhead Hall, and that residence had been purchased by the Corporation. Instead of being looked upon, as the Corporation should be, as the preservers of the district, they were regarded as the destroyers, because, in consequence of their desire to keep the water of the lake as pure as possible, they, as the possessors of the house, would become the owners of all the drainage round—the lords of the manor—so that the water of the lake would not be polluted but kept in its pristine state, and the operations of the Corporation ought to be hailed with satisfaction rather than with apprehension. The area of the lake would be greatly increased; and speaking as an enthusiastic admirer of fine scenery, although small lakes and high mountains might be very grand and terrible, yet as a matter of beauty everything ought to be in harmony, and a small lake in the midst of high mountains was not so beautiful as if it were in greater conformity with the scenery around. Therefore Thirlmere Lake being enlarged would be more in harmony with the mountain peaks that enclosed it. At present only the upper and nearest part of the lake was seen by one tourist in ten thousand. The lower part was private property—there was no road to it. The Corporation proposed to make a road all round the lake, and to maintain it at their own expense, to which they would give perfect freedom to all tourists. The town of Keswick was the only one between Thirlmere and Manchester interested in the question; 650 out of 700 ratepayers of Keswick had petitioned in favour of the Bill, showing they fully appreciate the benefits to be conferred by the Corporation on that district, and it was thought that, so far from its being an injury, it would be a benefit to the country. The work from the lake would commence by a tunnel between two and three miles long; it would then enter into a "cut and cover," it would be cut in the solid, having an archway, and the tunnel would be covered over, so that, being invisible, no one would know even where the aqueduct was. The work of making the tunnel would hardly be seen, and every care taken to keep it from view. It would pass by Grasmere, Ambleside, Windermere, Kendal, Preston, Chorley, Blackburn, Horwich, Bolton, and to Manchester, to which latter town it would be conveyed by iron pipes to the present service pipes of the Corporation. It was hoped that such an illusory idea as that of connecting all the different towns in Lancashire and Yorkshire in one common object for getting a supply of water would not be permitted by the good sense of the House of Commons. He trusted, therefore, that Mr. Howard's motion would not be carried into effect, as it would only defer the object they had in view for years.

The PRESIDENT: I think Mr. Birley spoke of the fallacy that pervaded the public mind on the hypothesis that Manchester was about to provide water for a greatly extended district, and he also said that the natural annual increased requirements of the districts were from 750,000 gallons a day. I want to know whether the plan of the Corporation is greatly to extend the existing area over which they now have to distribute water?

The MAYOR: We have not sought to supply any other district.

The PRESIDENT: I have heard with great interest Mr. Bateman's admirable exposition of the plan which he has prepared for the great and important community which you represent, and it hardly required even so much as he said to interest me in what, of course, is a most important proposal. You have made two requests—one that the Government will support the second reading of your Bill; the other is that they will oppose the motion of Mr. Howard. At all events you have given me your reasons for wishing the aid of the Government in getting the attention of Parliament and of the Parliamentary Committee to the details of your scheme. For that you have very strong grounds to trust to the universal practice of the House not to baulk in its inception anything so large and important as this is. Whatever view the House may take it is not for me to say. I shall report to the Government all you have stated to me here, and consult, no doubt, the Chancellor of the Exchequer, who will communicate what course he will take on the two questions, both of which will shortly come on, on Mr. Howard's motion and the second reading of your Bill; and I can only promise for my own part that I will lay before him what you have stated, and urge the great importance of the subject of looking upon it, in the Government point of view, in a dispassionate manner. You have not said when the second reading of this Bill is fixed for?

The MAYOR: The 6th of February, it is understood.

The PRESIDENT: Then, at any rate, Mr. Howard's motion is pretty certain to come on first?

The MAYOR: Yes.

The PRESIDENT: The two questions are not identical; I wish to caution you upon that, and I say that the Government may take one course upon the one and another course upon the other; but, however that may be, I shall have great pleasure in seeing the Chancellor of the Exchequer upon it, and shall tell him all you have said.

The Deputation having thanked the President for his courtesy, retired.

FAVERSHAM WATER COMPANY.—The Directors of this Company recommended the declaration of a general dividend this year of 7 per cent.



LEEK GAS SUPPLY.

A Meeting of the Leek Improvement Commissioners was held on the 22nd inst.—Mr. J. Brouck in the chair.

Mr. ALLEN (the Law Clerk) read a communication from the Local Government Board, in which they stated that they had no power to authorize the Commissioners to enter into a contract for gas-works, to defray the cost of which a loan would be required. The Board pointed out that the Commissioners had at present exhausted their borrowing powers for gas purposes, and that before any further loan for such purposes could be obtained, fresh borrowing powers were required from Parliament. The Board were not in a position to say whether the Provisional Order to confirm such power on the Commissioners as that for which application had been made, would be confirmed by Parliament if issued. The Board regretted any inconvenience to which the Commissioners might be exposed in the matter, but they were of opinion that it might have been prevented had the suggestion made in a former letter been acted upon.

On this untoward state of things the *Staffordshire Sentinel* remarks:—"For once the usually wide-awake Leek Commissioners seem to have been caught napping. They want to borrow money for a new gasholder; but their borrowing powers are exhausted, and they have not given notice of application to Parliament for an extension of their borrowing limits. The result is that Leek, so far as its gas provision is concerned, is likely to find itself next winter in the position of a promising youth who has outgrown his clothes. It is a lucky and an unlucky dilemma. Lucky, because the increased demand for gas proves the increasing importance of the town, and because, the gas-works being public property, every additional 1000 feet consumed represents a profit of which the ratepayers have the whole advantage. On the other hand, it is unlucky because it involves the unpleasant possibility that when the now lengthening days grow short again, the clergy of all denominations may find their 'thirdly,' abruptly cut short for want of light on the subject, while for the same reason a rule *nisi* will pass for a temporary divorce between buyers and sellers, involuntarily short time will prevail in the busy mills, and those who love 'fourpenny' not wisely but too well will not be able to find a lamp-post to embrace. The only gainers will be lovers, thieves, and shopmen. The latter will rejoice in a universal early-closing movement; while the two former, who, for similar reasons, love darkness rather than light, will, under the friendly shade, forge the fetters of Hymen and of the policeman. The Commissioners do not relish the prospect, and, like a dutiful child in trouble going to his father, have applied to the Local Government Board to help them. Like too many fathers, the said Board has proved itself only a Job's comforter. It adopts the 'I told you so' style, which is the most irritating of all possible forms of consolation to anybody who has got himself into a mess. 'The Board regretted any inconvenience to which the Commissioners might be exposed in the matter'—who has not heard such expressions of regret from a candid friend?—but they were of opinion that it might have been prevented had the suggestion made in a former letter been acted upon.' Of course. There never was a difficulty which might not have been prevented if something had been done which was not done. But the Board hold out a glimmer of light to the Commissioners in their threatened darkness. The hope it offers is about as vague as that which Burns gives 'the Deil'—'Ye aiblins might, I dinna ken.' Whether a Provisional Order, if issued, would be confirmed by Parliament, they 'were not in a position to say.' There were kings before Agamemnon, and after him for that matter. Let the Leek Commissioners take heart of grace, or grease. Time was when the world knew not gas; the time will be when it will know it no more. Why not fall back on tallow or ile? Better still, why not venture forth, like Columbus, in search of a new world, in quest of the 'light of coming days?' We suggest the electric light. It might be tried tentatively in the first-class waiting-rooms at the railway station, where, as we can aver from painful experience, light is now, at least on Sunday nights, too often 'conspicuous by its absence.' There are compensations in everything, and if all these resources fail the moorland town will still have a glorious opportunity of verifying the adage which promises health, wealth, and wisdom to those who go 'early to bed.'"

DYNAMO-ELECTRIC APPARATUS.

At the Meeting of the Institution of Civil Engineers, on Tuesday, the 22nd inst.—Mr. BATEMAN, President, in the chair—the paper read was on "Some Recent Improvements in Dynamo-Electric Apparatus," by Dr. Higgs, Assoc. Inst. C.E., and Mr. Brittle, Assoc. Inst. C.E.

In a brief review of the rise and progress of this branch of electricity, the authors stated that the practical application of Faraday's important addition to electrical knowledge appeared in the first magneto-electric machine, constructed in 1833 by Pixii, and subsequently improved by Saxton and Clarke. The use of machines of large size, driven at high speed, was suggested by Professor Nollet. In 1854, Dr. Siemens, of Berlin, introduced the Siemens armature. The principle of accumulation by successive action, by combining two cylindrical armature machines, was due to Mr. Wilde. All these magneto-electric machines were disadvantageous in use, because their effect did not increase with their dimensions. In 1867, Dr. Siemens patented a machine to obviate rapid reversals. The step from magneto-electric to dynamo-electric machines originated with Dr. Werner Siemens, Sir Charles Wheatstone, and Mr. S. A. Varley, the priority falling to the former. In the Siemens machine a peculiar method of winding the wire on the armature, devised by Mr. Von Hefner Alteneck, was employed. In the Gramme machine, a principle was adopted which had been described by Pacinotti in 1863, of whose apparatus the present Gramme machine was a modification.

A description was then given of the latest construction of Siemens Dynamo-Electric Machine and Electric Lamp, the latter devised specially for lighthouse illumination, and similar lamps were about to be supplied for the Lizard Lighthouse. The dimensions, weights, number of revolutions made by the cylinder, light equivalent in normal candles, and horse power required for driving, were, for three sizes of machines:—

Dimensions in Inches.			Weight in Pounds.	Revolutions of Cylinder.	Candles Light.	Horse Power.
Length.	Width.	Height.				
25	21	8.8	298	1100	1,000	1½ to 2
29	25	9.5	419	850	4,000	3 to 3½
44	28.3	12.6	1279	480	14,800	9 to 10

In the application to lighting purposes, the improvements in the present dynamo machines were obvious. The magneto-electric machines first employed in lighthouse illumination, as pointed out by Dr. Tyndall, bore a cost of 10 to 1 as compared with the latest dynamo machine; while the cubic spaces occupied were as 25 to 1, and the weights as 15 to 1, the total light power produced for the condensed beam of light being as about 1 to 5. Thus, with a cost 10 times, with a weight 14 times, and a volume

25 times that of the latest construction, the old machine produced one-fifth of the light, with an expenditure of practically the same driving power.

The results of experiments with the electric light apparatus by Captain Abney, R.E., at Fort Monkton, in July, 1875, were given; but a more instructive series were contained in the Trinity House Report on the "Comparative Trials of Electric Lights at the South Foreland," from August, 1876, to July, 1877.\*

An important factor in the light efficiency of a given machine was the resistance of the circuit leading to the lamps. Experiment indicated that, to obtain a maximum of light, the resistance of the conducting wires should be proportioned to that of the machine. In the use of dynamo or magneto-electric machines, the chances of stoppages had been quoted as a serious disadvantage; but these chances had been so reduced as not to exceed those arising with machines generally. The Trinity House Report stated that "the No. 68 Siemens machine worked well from the 7th of March to the 7th of April, without any necessity for a stoppage. On the 11th of March the commutator plates and brushes were adjusted; on the 19th the brushes were renewed; on the 28th the commutator plates and brushes were again adjusted; and on the 6th of April the commutator plates and brushes were renewed." The duration of the light, owing to required renewal of carbons, was limited to a certain number of hours, dependent on the size of the carbons and the machine employed.

Much excitement had been evinced as to the probable competition between gas and electricity, as sources of light-power. Although, under certain circumstances, these two agents undoubtedly came into competition, they had two separate fields. Hitherto gas had been employed for lighting spaces of both large and small dimensions, because a better source of light for large spaces had not been procurable with economy. But for lighting large spaces not subdivided by opaque objects or screens, it was a want of economy to employ gas. Assuming light power proportional to horse power expended, 100 horse power would give 150,000 candles light; distributed from three points, the cost would not be more than £1 2s. 6d. per hour, each light-centre giving an illumination which would enable small print to be read at a distance of a quarter of a mile from the light. A burner giving the light of 20 candles consumed 6 cubic feet of gas per hour, which might be manufactured at a cost of 2s. per 1000 cubic feet. This gave 7500 burners light only, and 45,000 cubic feet of gas, at a cost of £4 5s. per hour, a ratio of 4 to 1 in favour of electric lighting. The economical ratios differed greatly, being dependent chiefly upon the price of gas and of the motor power employed. For large spaces the cost of electric lighting was about one-fourth, or even one-fifth that of gas lighting, when steam had been used as power, and wear and tear were reckoned. With a gas-engine as motor, the ratio had only been as 1 to 3, the greatest economy having been with a turbine as a motor. At M. Dieu's workshops at Davours, the cost per hour for gas was 2s. 0.632d. against 1s. 7.2d. for electric lighting. M. Ducommun found, taking into account wear and tear and interest, that gas cost 2.25 times more than the electric light, which ratio was increased to 7.15 when wear and tear and interest were left out of consideration. At Messrs. Siemens Brothers Telegraph Works the economy was as 2 to 1 in favour of electric lighting. If, however, the ratio of light intensities were adopted as the ratio of efficiency, the advantage would be considerably higher (20 to 1) in favour of electric lighting. It might be laid down, as proved by experience, that for lighting large spaces, not too much subdivided, the advantage was greatly in favour of the electric light; but that where numerous light-centres of small intensity were required, or where the space was much subdivided, the advantage was in favour of gas. This advantage would cease when a practical method of subdividing the electric light was obtained.

The limit set by distance to the transmission of power, by means at present adopted, had been comparatively narrow. Hydraulic power had been the most adaptable, with, however, several important disadvantages. Although electricity as a means of transmission was also limited by the distance to be traversed, the limit was in this case much more extensible, and under favourable instances practically disappeared. For the transmission of power, say from a steam or water motor initially, the following system was adopted:—First, a strap or belt from the motor was carried to the pulley of the driving dynamo-electric machine which generated the current. By leading-wires of the required length, the electrical current generated in the first machine was conveyed to the terminals of a second and precisely similar machine. Thus the first machine generated the current which was utilized in imparting motion to the second machine. The greatest work was yielded by the second machine when the strength of the current given by the first machine or source had been reduced to one-half, by the induced current from the second machine. Supposing two equal machines arranged for the transmission of power, the amount of work reclaimable from the second machine would be 50 per cent. of that employed upon the first, and the number of revolutions of the armature of the second machine, corresponding to the maximum of work reclaimed, would be half the number made by the first. Experiments also proved that the loss of efficiency was proportional to the added resistance.

The employment of the currents of magneto-electric machines for electrotyping and electroplating had long superseded the voltaic current. It was, however, only on a large scale that the current from a dynamo machine could be used with advantage. For small electro separations, or depositions, magneto-electric machines had been constructed. For the deposition of large quantities of metal, where by changing baths in succession little change was made in the total circuit resistance, the dynamo machine gave much greater economy. With one of these machines, and a proper succession of vats, as much as 3 tons of copper had been deposited daily.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The political events of the past few days have again reacted in a prejudicial manner upon all commercial enterprises, and it would seem to be quite certain that there will be no appreciable expansion of any of the leading branches of trade until the present uncertainty and liability to war are removed. In all directions would-be purchasers are afraid to complete transactions in the present state of affairs, and producers hardly know what to do to be right. Up to now the principal pig-iron smelters have continued to maintain a steady output, especially of good foundry pigs, which are to a great extent being delivered in execution of contracts which have been entered into since the commencement of the new year. In the open market here, very few parcels have this week changed hands, and the local agents of most of the Yorkshire and Derbyshire producers are complaining very bitterly of the minimized amount of business which is being done. The reductions of wages, to which I have made reference at some length on former occasions, have for the most part been carried out in a pacific manner, the men being apparently convinced, at last, that the depression is such that they must perforce fall in with their employers' views, if they would have any employment at all. The ironworkers, as a

\* These tables were published in the JOURNAL, Dec. 11, 1877.



class, are very badly off, and the amount of distress amongst their families here is so great that all the energies and resources of a large and influential town's committee are being taxed to the utmost to provide for them. This cheerless state of affairs is not merely owing to the current depression of trade, but is, as has been fittingly remarked by Mr. George Wilson, Managing Director of Charles Cammell and Co., to a great extent brought about by the constantly increasing way in which steel of various kinds is being used instead of iron. There is, therefore, but a poor outlook for many of the puddlers and others, but, on the whole, the abolition of puddling would not be a matter for great regret, inasmuch as it involves labour which is admittedly of the most severe and unintellectual description. In finished iron there has been no movement whatever this week.

There is a considerable demand for house coal of all qualities, both on account of the local and metropolitan markets. Steam coal is neglected, and will in the usual course remain very quiet until the reopening of the shipping season to the Baltic and other northern ports. Prices are quiet all round, owing to the very severe competition that exists.

#### THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Business continues extremely dull both in the iron and coal trades of this district, and there is so much uncertainty with regard to the future, that consumers will only buy for their hand-to-mouth requirements, and these are extremely small, owing to the general depression in all branches of trade.

For the better classes of coal the market continues fairly steady, but the inferior descriptions of fuel, which are difficult to move, and generally a drug, are weak in price, the underselling amongst needy holders, who are compelled to seek for orders in the open market, causing a general want of firmness. House-fire classes of fuel, which meet with a moderate demand, about equal to the present production, are quoted at the pit mouth at about 10s. to 11s. per ton for best Wigan Arley, 8s. to 9s. for common ditto, about 8s. 6d. for Pemberton four-feet, and 6s. 6d. to 7s. 6d. per ton for common round coal, suitable for house-fire purposes. Common coal, for forge and steam purposes, which meets with but a very limited inquiry, is quoted at from 5s. 6d. to 6s. 6d. per ton, and burgy, which is also very quiet, is offered at from 4s. 3d. to 5s. 6d. per ton at the pit, according to quality. There is a slight improvement in slack, which does not appear to be quite so much pushed in the market, and good ordinary sorts are quoted at from 3s. to 4s. per ton at the pit.

There is still very little doing in the shipping trade, with a keen competition for any orders in the market, especially at the high level, Liverpool, where common coal is offered at 6s. 6d. and 6s. 9d. per ton.

There is yet a great deal of underselling in the iron trade, and local producers of pig iron who adhere to late rates are securing very few new orders at present. Holders of outside brands, although they are offering at very low figures, are also doing very little business in this district. The finished iron trade continues very depressed, and for delivery into the Manchester district the quotations remain at £6 3s. 6d. to £6 5s. for Middlesbrough bars, £6 5s. to £6 7s. 6d. for Lancashire, £6 7s. 6d. to £6 10s. for North Staffordshire, £4 5s. to £4 6s. 6d. for Middlesbrough puddled bars, and £4 17s. 6d. for North Staffordshire ditto.

#### THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

Last week was a very anxious one in the North of England. Everything seemed unsettled, and merchants hardly knew what to do. Under these circumstances, very little trade was done, except in best gas coals. Several more contracts have been made for best gas coals to be delivered over the year, one or two of them were for large gas companies, and were heavy. The prices arranged for were, as near as could be, 7s. 6d. per ton, less 2½. This seems to be the ruling quotation upon which all the contracts for best gas coals were made. Best gas, for immediate shipment, in some instances has been sold at 8s. per ton, less 2½. Several cargoes of gas coals have been shipped to the Italian ports. The Irish demand is very well sustained, and three or four more cargoes have been sent to Boston, U.S. The following is the figure for the latter:—8s. per ton, less 2½, f.o.b.; 5s. 6d. freight, 3s. 6d. duty charged by the American Government, and the ordinary port charges upon cargoes landed at Boston. The inquiry for second-class gas coals is highly irregular, and much of it is merely local. Notwithstanding the continuance of the strike in the Northumberland steam coal district, the shipments of Durham coals have been less during January than in the previous month of December. The inquiry for house coals has been improved by the sudden appearance of intensely cold winter weather. Rates for very best are 12s. 6d.; second best, 11s.; inferior, 9s. 6d. to 10s., less 2½. The dispute in the Northumberland steam coal trade is likely to be brought to a termination by the men agreeing to work by a sliding scale, the same as in Durham.

The coasting business never was more dull in mid-winter than it is at present. Coasting steamers in the market are quite in excess of the demand. About 4s. 1½d. is the rate paid steamers to take coal to London, and 5s. 9d. to small sailing ships of between 5 and 10 keels, to be discharged at the wharves in London river. Most of the small ships that reach the northern coal ports have been freighted by the gas companies previously, and therefore there is little business done in chartering vessels in the open market. Gas coals are taken by steamers to some of the larger ports in Ireland at a somewhat low rate of freight. Coals are shipped to South America but in very moderate quantities. The East India trade is opening out better for steamers, but no one can have any conception what the Mediterranean and Black Sea trades will be over the next three months. If there is peace, there will be a very brisk demand for iron steam tonnage. If our country were involved in war, shipping would be thrown into inextricable confusion.

A good deal of pig iron is being shipped abroad. Russia is building 100 torpedo boats, to be propelled by steam, and agents have been engaging men on the Tyne to go out to St. Petersburg to be employed in making these war vessels. The fire-brick, cement, and other industries are dull. Goods are being shipped to South America and Japan, but the general shipping business is exceptionally flat. The iron trade is without change.

Numbers of pitmen, seamen, and other north country workpeople are out of employment, and many have been so for several weeks. They are literally starving. There has been no such continued depression of trade in the north country for the past 20 years.

#### TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Since the gas supply of the town of Alloa was taken over by the Municipal Authorities, the Gas Committee of the Police Commission have been arranging with Mr. George Boyd, the Manager of the Gas-Works, to prepare a report upon the state of the supply-mains throughout the town, and other plant, chiefly with the view of ensuring an equalization of the pressure and economical distribution of the gas. Mr. Boyd has, after a very complete survey, made a report recommending the expenditure of about

£900, and it is probable that estimates for the proposed work will be taken forthwith.

On the recommendation of their Lighting Committee, the Police Commissioners of Inverness have resolved to erect a large number of new gas-lamps, and the Gas and Water Committee are moving with the view of erecting a new gasholder, and, therefore, secure a larger amount of storage capacity, as recommended some time ago in the report prepared by Mr. Smith, of Aberdeen.

The village of Newport, an important residential suburb of Dundee on, the south side of the Tay, is about to set up as many as 36 new street-lamps for lighting up its darkness. It is stated that they are the result of a private subscription recently made amongst the residents. An attempt was made to raise the necessary funds by means of a voluntary assessment, but that did not succeed. The lighting of the lamps hitherto in use has been provided for by a levy, made upon every consumer by the Gas Company, to the extent of 3d. per 1000 cubic feet, which may be regarded as a sort of equitable assessment, inasmuch as it bears very lightly on the small householder, and is not heavy on the large ones, while it costs, or may be said to cost, nothing for collection. By-and-by, however, it is very probable that the people within the area of the gas supply will require to go in for the adoption of the Police Act.

Dr. Wallace's report on the illuminating power of the Glasgow gas for the week ending on the 19th inst. shows what may be regarded as very good results. In no instance was the minimum under 25·90 candles, while in one district it was as high as 27·69 candles. The average ranged from 26·30 candles to 28·78 candles, and the maximum varied, over the four testing-stations, between 26·92 candles and 30·33 candles. The last-mentioned maximum has been very seldom reached during the last few months.

In connection with the consideration of Mr. J. F. King's usual report on the analysis of the gas supplied to the City of Edinburgh, presented to the Town Council on Tuesday last, a discussion of some interest arose. The analysis made on the 10th inst. showed the illuminating power of the Edinburgh Company's gas to be equal to 28·90 standard candles, and that of the Leith Company to be equal to 25·70 candles. Mr. Somerville proposed that the report be remitted to the Cleaning and Lighting Committee for consideration. Evidently, he said, the quality of the Leith gas was getting worse instead of better, and he had been told the gas for the street lamps was taken from both Companies. Bailie Colston said the city paid about £9000 a year to the Edinburgh Company, and £200 to the Leith Company, the latter not being for public lamps at all. Mr. McLachlan said that an analysis should be got of the gas supplied to other towns, so as to be able to institute a comparison with the Edinburgh gas, which was charged so dear; to which Bailie Rowatt replied that all this had been got before, and that Edinburgh was found to stand higher than any other city in Great Britain or Ireland. The average of all the other towns was 16 candles, while that of Edinburgh was 27 candles. The motion was agreed to.

I understand that a conference recently took place at Dumfries between Mr. B. M. McCrae, of Dundee, and Mr. S. Stewart, of Greenock, the two gentlemen who have been commissioned to act as the arbitrators in the transference of the gas-works of that town to the Municipal Authorities, under Sir Windham Anstruther's Gas Act, the former for the Town Council, and the latter for the Gas Company. In the event of any difficulty arising between them in the course of the arbitration, they have mutually chosen Mr. Alexander Smith, Corporation Gas-Works, Aberdeen, as the umpire or oversman.

At the last meeting of the Police Commissioners of Glasgow it was stated that a report had been submitted to the Watching and Lighting Committee, by the Inspector of Lighting, in reference to an application from the lamplighters for an increase of wages. The report recommended an additional grade of lamplighters, with increased pay, on the ground that during the year there had been a considerable increase of work, owing to the substitution of swallow-tail burners for single jets. The rates of wages recommended for the two grades of lamplighters were 20s. and 22s. per week, and were arrived at from a comparison of the rates paid in Belfast, Birmingham, Bristol, Dublin, Manchester, Leeds, and Liverpool, with those hitherto paid in Glasgow.

On the evening of Friday week the burgh of Crosshill and part of Govanhill, both of which are in the southern suburbs of Glasgow, were suddenly thrown into total darkness by the extinction of the gas in the houses and in the streets. The places of business were about to close, and considerable inconvenience was experienced in consequence. For a time there was quite a flutter of excitement amongst the inhabitants, and a general stampede for candles was made upon the shopkeepers who were fortunate enough to have a stock on hand. It was stated that during the day some repairs had been executed upon the governor for the district, and that the accident arose from it, as there was an ample supply of gas at the time, in the gasholders at the Tradeston works from which the district is supplied. After the lapse of about three-quarters of an hour matters were put to rights, and the gas again lighted.

The Glasgow pig iron market has shown a rather hardening tendency during the past week, and a good business was done. At the close on Friday afternoon as high as 50s. 11d. to 51s., cash, and 51s. 2d. to 51s. 2½d. were paid, with buyers remaining at the higher quotations. Coltness No. 3 has been advanced in price 6d. per ton.

No improvement can be reported regarding the coal market. Miners' wages have been very generally reduced about 6d. per day during the last few weeks.

**HULL GAS SUPPLY.**—Mr. J. Baynes reports that the gas sent into the district of Sculcoates and Myton, by the British Gas Company, during December, 1877, gave the following results, sulphuretted hydrogen and free ammonia being at no time present to the ordinary tests:—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16·40	14·97	15·70
Grains of sulphur per 100 feet	31·00	27·60	29·02
Grains of ammonia per 100 cubic feet	—	—	0·25
Mean barometer, 29·93; temperature 56°.			

**SEVENOAKS WATER-WORKS COMPANY.**—At an extraordinary meeting of Proprietors on the 15th inst., it was resolved—"That instead of the remaining share capital of the Company, consisting of 69 shares of £20 each, being disposed of by the Directors by public auction, as provided by resolution of general meeting, held on July 17, 1877, the Directors be and they are hereby authorized to offer such shares, or a sufficient number of them, at par, to the registered Shareholders of the Company, at the date of such offer, in the following proportions, viz.:—To the holder of eight shares, one share, and to the holder of more than eight shares, one share for every eight shares held by him or her."

**MARGATE WATER-WORKS COMPANY.**—The Ordinary General Meeting was held on the 21st inst.—Alderman Pickering in the chair. The balance-sheet was very satisfactory, and a dividend of 5 per cent. for the half year was declared, making, with an interim dividend of 5 per cent., the maximum dividend of 10 per cent. for the year. It was stated that efforts are being made, by the completion of a new pumping-station in the Dane, to secure an ample supply of good water to meet the increasing demand of the town, which has become considerably enlarged of late years; and the Chairman



said that, as it would be necessary to borrow money for the extension of the plant, it was in contemplation to apply to Parliament for a Provisional Order to raise the capital required.

**PAISLEY GAS-WORKS EMPLOYEES SOIRÉE.**—The first *soirée* of the *employés* of the Corporation Gas-Works was held in the Abercorn Rooms last Thursday night. The large hall was quite filled. Provost Murray presided, and beside him on the platform were other members of the Town Council; Messrs. Young and Martin, Town Clerks; the Rev. Mr. France, &c. After tea, the Chairman, in a brief speech, referred to the relations that ought to exist between employers and employed, the necessity of steadiness on the part of gas workers, and the advantages of cultivating habits of prudence in the conduct of life. Other speakers followed, and a large musical programme was also gone through, a very agreeable evening being spent.

**GAS EXPLOSION AT EASTBOURNE.**—On Tuesday last an explosion of gas occurred at 13, Victoria Place, Eastbourne. The house is at present unoccupied; but, with a view to air the rooms, it has been the custom to keep the gas light in the house during the daytime. A person went to the house for the purpose of lighting the gas about noon. Soon after he had done so the neighbours were alarmed by a report, accompanied by the sound of broken glass. An examination of the premises showed that considerable damage had been done. The window of the dining-room was found to be blown out, and the door was forced off its hinges and thrown into the passage. The plate-glass of the drawing-room was hurled into the street; the kitchen window was dashed inwards, and glass broken in other parts of the house. Some paintings in the room were seriously damaged, and the ceilings of the lower rooms were more or less injured. The damage altogether is considerable; but the house, as well as the furniture, is insured.

**BRADFORD CORPORATION WATER BILL.**—A meeting of owners and occupiers of property in Pudsey was held on the 21st inst., at which it was resolved:—“That consent be given to the Local Board, either alone or in combination with any other local authority or authorities, to oppose in Parliament a Bill proposed to be introduced during the next session by the Mayor, Aldermen, and Burgesses of the Borough of Bradford, for conferring upon them further powers in relation to their water-works, in order to obtain the introduction of clauses into such Bill, fixing the maximum prices for water to be supplied by the Corporation in this and other districts outside the Borough, within the Corporation’s limits of water supply; and providing that the distribution of the water supply, and the price to be charged below the maximum, shall, in cases of difference, be settled by arbitration, under the Public Health Act, 1875; and for the purpose of such opposition to incur all necessary and proper expenses, which shall be payable out of the general district rate.”

**PARTICK, HILLHEAD, AND MARYHILL GAS-WORKS EMPLOYEES SOIRÉE.**—The sixth annual festival of the *employés* of this Company took place last Friday night, in the Burgh Hall, Hillhead. Provost Ferguson occupied the chair, and on the platform were the following gentlemen:—Provost Cowan, Rev. Mr. Shanks, of Maryhill, Messrs. Andrew Paton, George R. Alexander, Paterson Wingate, John Wilson, W. Macleod, T. O. Niven, A. C. Wilson, James Hislop, Wm. Graham, &c. The Chairman, in the course of an interesting address, referred to the continued prosperity of the Company and the quality of the gas, which, he said, was second to none. The Company were established in 1872, and during that year 67 million cubic feet of gas were manufactured. Although they had to contend against a good many difficulties at the outset, yet by perseverance, good management, and producing a good article, they had been able to surmount all obstacles. The consumption at present was 120 million cubic feet annually, which was a very rapid increase. He was also very glad to learn that the *employés* all worked harmoniously together. The programme for the evening was a very inviting one, embracing songs, humorous readings, &c., and a double “service of fruit.” The musical part of the programme was sustained by Miss F. Wright, Mrs. Rushbury, Mr. Hamilton, and Mr. West.

**REDUCTION IN THE CONSUMPTION OF WATER AT GLASGOW.**—At the meeting of the Water Committee of the Glasgow Corporation on the 21st inst., the minute of the sub-committee on district meters was presented. It contained a tabular report by Mr. Gale, showing the results of the system of inspection from the commencement in April, 1876, to Dec. 11, 1877. Five districts were thus dealt with, all in the west and north-west parts of the city, and the following is an abstract of the results:—

Number of District.		Gallons per Head per Day.			
		At Starting of Meter.		Latest Results.	
		Total.	Night Rate per 24 Hours.	Total.	Night Rate per 24 Hours.
District No. I.	15,380	59.2	45.0	38.9	17.4
Do. II.	10,424	65.8	60.2	36.4	24.9
Do. III.	5,014	61.4	53.0	33.8	15.1
Do. IV.	7,946	65.8	47.5	38.8	21.0
Do. V. (Part of)	5,682	42.7	27.5	26.7	12.2
Total and averages	44,346		47.5		18.9
Average consumption per head at night, at starting of meter					
			47.5 gallons per 24 hours.		
Ditto, at Dec. 22, 1877			18.9	ditto.	
Saving			28.6 gallons per 24 hours.		
Total population at night, 44,346 × 28.6 =			1,268,300 gallons.		

**SUFFOCATION BY GAS AT DUNDEE.**—Considerable sensation was created in Foundry Lane and neighbourhood in the east end of Dundee, on Monday, the 21st inst., when it became known that two persons, a mother and her daughter, had been suffocated by gas. The victims, Mrs. Thomas Fields and her daughter, Eliza, lived together in a two-roomed house in Foundry Lane, and both earned a livelihood as mill workers. They were last seen on the previous Saturday. On that night and on Sunday a strong smell of gas was felt in the tenement by the neighbours, but nothing serious was apprehended. On Monday evening, however, as the smell still continued, an inspection of the premises was made, and as the deceased persons had not been seen at meal hours as usual, and the key of the door was found in the lock inside, the suspicion was aroused that something was seriously wrong. Mr. McCrae, the Manager of the Gas-Works, was sent for, and he, and a plumber who resides in the house above that in which the deceased resided, burst open the door. The house at this time was quite dark, and was so full of gas that they could not venture to enter for a considerable time. They then procured a lamp, and on entering the house were horror-struck to find Mrs. Fields and her daughter lying in bed quite cold and dead, having evidently been suffocated by gas. No gas-meter was in the house, and a paraffin lamp had

been used to give light. Below the sink the end of the inlet gas-pipe had been fractured by some utensils having been placed against it, and from this fracture the gas was found escaping very largely. It is believed that the deceased had both been suffocated on the Saturday night, or early on Sunday morning.—*Glasgow Herald*.

**HULL WATER SUPPLY.**—Mr. Maxwell, the Engineer of the Hull Corporation Water-Works, has submitted to the Committee having charge of this department schemes for new water-works, at a cost of over £40,000. He says that 20 years hence Hull will in all probability require 10½ million gallons per day, or 5 millions more than at present. Estimating the full power of Springhead at 6 million gallons per day, the Corporation must provide 4½ millions, or 75 per cent., more water. With a view to this further supply he suggests three schemes. The first refers to the “Dam Springs,” which are situated three miles north of Springhead, and when the watercourse was gauged last July it was found flowing at the rate of 3 million gallons per day, which could be supplemented, if necessary, in dry seasons. The scheme he estimates would cost £41,000. The second site suggested is in the vicinity of Keldgate, about two and a quarter miles north-west of Springhead. The water from the springs here was found running at the rate of 8 million gallons per day in February last year. An additional advantage over the first-mentioned scheme is that this possesses fields at such elevations as to be suitable for reservoirs. Total cost £42,500. The third project mooted is an extension of the present Springhead Works. For this purpose he suggests that from the new (Woodhouse) shaft, at about 65 feet below the surface, they should strike an adit about a mile long, rising 12 feet. The adit would be left unlined, with a chalk surface of 66,000 square feet, and, intercepting numerous fissures in the rock, would doubtless of itself bring down to the shaft a large additional quantity of water. But, besides this, one bore could be sunk at half a mile distance from Springhead, another at three-quarters, and a third at the extremity of the adit. From each bore he expected a million gallons daily additional, which would bring the total supply up to 10 millions. Total cost, £31,500. The engineer has now been requested to report as to the quantity of water supplied for manufacturing and sanitary purposes, and whether Stoneferry could not be utilized for such purposes, and the cost of adopting the same.

**LIGHTING BY ELECTRICITY.**—Dr. C.W. Siemens delivered an address before the Society of Telegraphic Engineers, on Wednesday evening last, on the progress of electric telegraphy. In the course of it he made the following remarks in reference to lighting by electricity:—“Much has been said about the application of electricity for producing light, and the French Alliance Company, as well as the Gramme Company, have, it is known, for some years been establishing magneto-electric apparatus to illuminate the lighthouses upon the French coast and for galvanoplastic purposes. By an ingenious combination of two magneto-electric machines, with Siemens armatures, Mr. Wilde, of Manchester, succeeded in greatly augmenting the effects produced by purely mechanical means; but the greatest impulse in this direction was given in 1866–67 by the introduction of the dynamo-electrical principle, which enables us to accumulate the current active in the electric circuit to the utmost extent permissible, by the conductive capacity of the wire employed. Dr. Tyndall and Mr. Douglass, Chief Engineer to the Trinity Board, in reporting lately to the Elder Brethren upon the power of these machines and their applicability to lighthouses, give a table showing that a machine weighing not more than 3 cwt. is capable of producing a light equal to 1250-candle power, per horse power expenditure of mechanical energy. Assuming that each horse power is maintained with an expenditure of 3 lbs. of coal per hour (which is an excessive estimate) it would appear that one pound of coal suffices to maintain a light equal to 417½ normal candles for one hour. The same amount of light would be produced by 139 cubic feet of gas of 18-candle power, for the production of which 30 lbs. of coals is consumed. Assuming that of this quantity, after heating the retorts, &c., 50 per cent. is returned in the form of gas coke, there remains a net expenditure of 15 lbs. of coal, in the case of gas lighting, to produce the effect of 1 lb. of fuel expended in electric lighting, or a ratio of 15 to 1 in favour of the latter. Add to the advantages of cheapness in maintenance, and of a reduced capital expenditure, in favour of the electric light, those of its great superiority in quality and its freedom from the deleterious effects of gas in heating and polluting the atmosphere in which it burns, and it seems not improbable that it will before long supersede its competitor in many of its applications. For lighthouses, for military purposes, and for the illumination of large works and public buildings, the electric light has already made steady progress, while for domestic applications the electric candle proposed by Jablochhoff, or modifications of the same, are likely to solve the difficulty of moderating and distributing the intense light produced by the ordinary electric lamp. The complete realization of all the advantages of the electric light remains, however, a problem to be solved, and it would be extravagant to expect, from applications on a small scale such as have hitherto been made, anything like the amount of relative advantage indicated by theory.”

**LUMINOSITY OF BENZOL WHEN BURNT WITH NON-LUMINOUS COMBUSTIBLE GASES.**—Professor Frankland and Mr. L. T. Thorne presented a paper on this subject at the meeting of the Chemical Society on Thursday, the 17th inst. It was pointed out by Professor Frankland, in 1852, that hydrogen, carbonic oxide, and marsh gas practically contribute nothing to the luminosity of coal gas, and that the only constituents of value were benzol, ethylene, propylene, butylene, and acetylene. The authors have endeavoured to determine the luminosity of benzol individually, and propose in future papers to make similar experiments on the other illuminating constituents of coal gas. Many attempts were made to burn benzol with a smokeless flame, and several lamps were constructed by Mr. Silber, but all the experiments yielded unsatisfactory results, and the authors had to limit their experiments to the determination of the luminosity of benzol vapour after dilution with hydrogen, carbonic oxide, and marsh gas. These three gases were separately prepared in the usual way, and were passed through a brass cylinder, 6½ inches long and 3 inches internal diameter, packed with sponge saturated with pure benzol, the whole being kept at a constant temperature by immersion in water. The quantity of benzol in the gas was determined by absorption with sulphuric acid. The authors obtained the following numbers:—One cubic foot of benzol vapour burnt in a fish tail burner with hydrogen gave, for one hour, the light of 69.71 candles; one ditto, carbonic oxide, 73.38; one ditto, marsh gas (1st series), 92.45; one ditto, marsh gas (2nd series), 93.94 candles, at the standard pressure and temperature. Hence 1 lb. avoirdupois of benzol gives, when burnt with hydrogen, the light yielded by 5.793 lbs. of spermaceti; with carbonic oxide, 6.100 lbs.; with marsh gas (1st series), 7.682 lbs.; with marsh gas (2nd series), 7.803 lbs. spermaceti; or, in other words, a given weight of benzol produces 5.3 per cent. more light when it is diluted with carbonic oxide, and between 32.6–34.7 per cent. more light when diluted with marsh gas, than when diffused in hydrogen. The authors point out that this difference is probably due, at all events in part, to the different pyrometric thermal effects of the gaseous mixtures. In reply to the Chairman (Professor Odling), Dr. Frankland stated that this increase in the illuminating power of benzol when mixed with marsh gas was not opposed to his former statement, that marsh gas did not contribute materially to the illuminating power of coal gas, because in coal gas the principal hydro-



carbons were ethylene and members of that series, which would not raise the temperature to any considerable extent when burnt with marsh gas, as compared with the effect produced by benzol vapour and marsh gas.

**PROPOSED PURCHASE OF THE STOKE GAS-WORKS.**—A meeting of ratepayers of the Local Board district of Fenton was held on the 22nd inst.—Mr. Malkin in the chair—to consider the question of the proposed purchase of the Stoke Gas-Works. In opening the proceedings, the Chairman said that some time ago the ratepayers approved of the purchase, together with Stoke, of the Gas Company's interest. All that now remained was that such approval should be confirmed, as the former meeting was called at a three days notice, and was consequently informal, because the Act of Parliament required a ten days notice. Upon the faith of the decision of the former meeting, the Local Board had gone on to the preliminaries of the purchase, in conjunction with the Stoke Corporation, and certain important expenses had been incurred. He would, therefore, propose—"That this meeting approves of the promotion of a Bill in Parliament in the ensuing session for the following, among other, purposes:—The acquiring, in conjunction with the Corporation of the borough of Stoke, of the gas-works and undertaking of the Stoke, Fenton, and Longton Gas Company, the conferring upon the Local Board and Corporation respectively all such powers as may be deemed necessary for carrying into effect the foregoing purchase, including the raising of the requisite funds therefor, and that the expenses of the Bill be charged to the general district rate account of the Board." Mr. Thomas Hassell seconded the motion. He recommended the scheme with confidence. In Fenton they had no sources of revenue beside the rates, and he thought that it was their duty to embrace an opportunity to lessen the rates. He had often wondered how the people in Leek got off with such small rates, but he had found out the secret—the Commissioners had for some time supplied the town with gas and water, and the profits were such as to reduce the rates considerably. In reply to a ratepayer, Mr. Hassell said that if Fenton were not to proceed with the purchase of the works, but to try and make her own gas, she would most certainly be opposed by Stoke. Indeed, there was not the remotest chance of the necessary power ever being granted. In reply to another ratepayer, the Chairman said that Fenton and Stoke would pay an equal amount of the purchase, and the profits would be divided according to the amount consumed in each district. He had no doubt but the consumption of gas in Fenton was as much as in Stoke. Longton Goods Station was in Fenton township, although it had not been reckoned so in the Company's receipts. After some explanations had been furnished by the Clerk, the motion was put and carried, with one dissentient.

### Register of New Patents.

3485.—CLARK, A. M., Chancery Lane, London, "*Improvements in the purification of gas.*" Patent dated Sept. 4, 1876.

Illuminating gas obtained from coal still contains, after passing through the condensers, volatile ammoniacal salts, principally carbonate and hydrosulphate, as well as free hydrosulphuric and carbonic acids. In purifying with oxide of iron, the latter absorbs the hydrosulphuric acid, whether free or combined with ammonia, and the gas on leaving the purifiers contains carbonic acid and a certain quantity of ammonia, generally insufficient, however, for converting the whole of the carbonic acid into carbonate, and *à fortiori* into bicarbonate of ammonia. The free carbonic acid remaining in the gas passes, either wholly or in part, to the burners, and impairs the illuminating power of the gas.

This excess of carbonic acid is usually removed from the gas by means of lime; but this invention consists in an improved process for absorbing it, whereby the whole of the carbonic acid remaining in the gas after purification with oxide of iron is transformed into sesquicarbonate, or preferably into bicarbonate of ammonia, both of which are soluble in water. To this end the gas, after being freed from the hydrosulphuric acid, is brought into intimate contact with caustic ammonia, in quantity sufficient to convert the carbonic acid into sesquicarbonate, or preferably bicarbonate of ammonia. This ammonia may be either in a gaseous or liquid condition, and if in a gaseous form it may be introduced into a pipe in which gas at a higher pressure is circulating. If the ammonia be employed in a liquid state, it is introduced into a vessel or receiver, and the gas made to bubble through it. The ammonia may also be introduced in the gas in the form of spray. In both cases the gas is passed through a series of washers or scrubbers, water, or the liquids obtained from the preceding operations, being used so as to completely dissolve the carbonate formed.

The quantity of ammonia it is necessary to introduce into the gas, to effect the complete transformation of the carbonic acid, necessarily varies with the conditions of the distillation and condensation, and the kind of coal, &c.; it is, therefore, necessary from time to time to test the amount of carbonic acid and of ammonia contained in the gas, in order to ascertain the quantity of ammonia required. The bicarbonate thus formed may be obtained in the form of a more or less concentrated solution, or even in a solid form, or in crystals formed in the liquor.

The bicarbonate of ammonia thus obtained is suited for various uses in the arts, and in the manufacture of chemical products; but instead of collecting the bicarbonate of ammonia, it may, at the moment of its formation, be made to effect certain chemical reactions and preparations. For example, saline solutions as neutral as possible, chlorides, sulphates, or nitrates may be placed in the second and third of the series of wash vessels above referred to, whereupon there will be formed bicarbonates, if solutions of soda or potash have been employed; or carbonates, which, being soluble, or but slightly soluble, will be deposited; hydrochlorate, sulphate, or nitrate of ammonia remaining in the liquid. The bicarbonates or carbonates are separated and purified by known processes.

The supernatant liquid may, if necessary, be again passed through the washing apparatus. The carbonic acid contained in the gas may also be absorbed in another manner by placing, in the several washing apparatus, a solution of carbonate of soda or potash, bicarbonate being formed on the passage of the gas, and deposited. There may also be placed in the washing apparatus the saline solutions above indicated, after dissolving therein gaseous ammonia, or adding thereto a highly concentrated solution of ammonia.

The apparatus employed in the application of these processes varies according to the nature of the products to be obtained. If it is desired to obtain products in solution, such as bicarbonate or carbonate of ammonia, a series of washing vessels may be employed, through which the gas is caused to bubble, or it may be passed through columns, or scrubbers. If solid products are to be obtained, washing apparatus provided with agitators or scrapers should be employed, and in the latter case it would be of advantage to isolate one of the washers in order to more readily extract the precipitate formed. All the above apparatus is well known in gas-making.

Instead of employing caustic ammonia in the before described operations, ammonia water may be used, deprived of the hydrosulphuric acid it may contain, or the same water may be used desulphuretted and concentrated by distillation. The carbonic acid contained in the gas may also be freed

by the action of ammonia after condensation. The ammonia in this case combines not only with the carbonic acid, but also with the free hydrosulphuric acid, although after a certain time the carbonic acid partially decomposes the hydrosulphate formed, and hydrosulphuric acid is again set free. It would, therefore, on account of this reaction, be difficult, if not impossible, to completely purify the gas by washing with water after the intervention of ammonia. This result is better obtained by passing the gas through neutral metallic solutions, and then through at least one oxide of iron purifier, in order to ensure a thorough purification.

The gas may also after condensation be passed through neutral metallic solutions, and after the absorption of the ammoniacal compounds it contains there may be added, by one of the methods before indicated, caustic ammonia in sufficient quantity to transform the free hydrosulphuric and carbonic acids into hydrosulphate or carbonate or bicarbonate of ammonia, which may be afterwards eliminated from the gas by washing.

The above processes are applicable to coal gas and gases obtained from other matters, and containing free carbonic acid. The gas obtained from wood would come under this category, but as it contains considerable quantities of pyroligneous acid, it is necessary that the latter be completely absorbed before the intervention of the ammonia.

3493.—GIDNEY, J. W., West Ham, "*Improvements in apparatus for carburetting air or gas for illuminating or heating purposes.*" Patent dated Sept. 5, 1876.

This invention relates to apparatus for carburetting air or gas, in which such air or gas is passed through or over hydrocarbon spirit, or through or amongst cotton, wool, or other fibrous material impregnated with such spirit; and has for its principal object the production of greater regularity of action and uniformity of flame than can be obtained in the apparatus now in use, in which the arrangements are such that the more volatile portions of the spirit are first absorbed, producing a light of high illuminating power, and then the less volatile portions, producing a light decreasing in intensity in proportion to the reduced volatility of the spirit being absorbed.

The invention consists, firstly, in arrangements and adaptations of apparatus, whereby not more than a certain pre-arranged quantity of spirit can be present in the carburetting chamber, and the supply of spirit thereto is kept up automatically in proportion as it is absorbed by the air or gas, whereby the spirit is used up as supplied to the carburetting chamber, and the flame remains of uniform intensity at all times when the apparatus is in action. In order to effect this a cistern or reservoir is employed for the spirit, so connected, by tubes or otherwise, with the carburetting chamber, as to form with it what is generally known as a bird fountain arrangement. According to one modification it is proposed to employ, between the reservoir and the carburetter, a valve, which is held open by suitable mechanical means, to allow of the spirit flowing as required from the reservoir to the carburetter. When it is required to refill the reservoir with spirit, the valve is closed automatically, whereby the overflow of spirit from the reservoir into the carburetter, at the time of filling the latter, is prevented, without the necessity of inverting the apparatus in order to effect the filling, which would be necessary without such an arrangement. The flow of spirit through the valve is regulated by a pipe or passage, the lower end of which dips into, or is sealed by, the spirit in the carburetter, the upper end opening into the upper part of the spirit reservoir. As the spirit is evaporated in the carburetter, the lower end of the pipe becomes unsealed, and air or gas passes from the carburetter up the pipe into the reservoir, allowing spirit to flow from the reservoir through the valve into the carburetter, until the lower end of the pipe or passage is again sealed and the further supply from the reservoir prevented. A tap or valve is adapted to allow the air in the reservoir to escape during the process of filling or refilling the reservoir, and it is sometimes preferred to arrange the mechanism for operating the tap or valve, and the valve connecting the reservoir with the carburetter, in such manner that the valve cannot be opened without first closing the tap, whereby undue overflowing of the contents of the reservoir into the carburetter is prevented.

Secondly, in an improved arrangement of governor or regulator for regulating and equalizing the pressure of the air or gas entering the apparatus, or of the carburetted air or gas leaving the same. For this purpose, in connection with the air inlet or gas outlet, a valve is employed, governed by a float resting on the surface of the liquid, and preferably this arrangement is used in connection with a collapsible governor chamber adapted with adjustable weights or springs, whereby the pressure can be regulated as required.

3500.—RITTER, F. W., Birmingham, "*Improvements in cocks or taps.*" Patent dated Sept. 6, 1876.

The object of this invention is to produce taps with smooth channels throughout, to prevent the corrosion thereof and damage to the liquids passing through such channels, by coating or lining the channels, and protecting the plugs of the taps with tin or other non-corrosive metal.

3504.—FITZMAURICE, A., Carlow, "*Improvements in pumps.*" Provisional protection only obtained. Dated Sept. 6, 1876.

This invention consists in an improved arrangement of double-action lever force-pump, and method of working the same by the weight of a man or other person sitting on one end of a weighted rocking lever.

The under side of the rocking lever is connected by means of suitable connecting-rods with the piston-rods of a pair of single-action lift and force pumps, having proper air vessels and rising main-pipes for delivering the water in the required direction. The suction-pipes from the pumps are connected together into the single suction-pipe which passes into the well or tank from which the water is to be raised.

3510.—ANDERSON, R. C., Wood Green, "*Improvements in valves.*" Patent dated Sept. 6, 1876.

The object of this invention is to reduce, at will, to any desired extent, the pressure of water, steam, air, or gases in pipes, or other conduits, while maintaining, at that reduced pressure, a constant flow of the liquid or fluid in the pipes. This object is effected by means of weights applied in such a manner that the amount by which the pressure is reduced is directly proportional to the weight applied, and so long as that particular weight is left undisturbed, the pressure will remain unaltered, irrespective of variations, either in the pressure of the supply, or in the quantity of liquid or fluid drawn off, and should the discharge at any time be reduced to *nil*, the valve will be closed entirely, and thus prevent any increase in the reduced pressure.

In carrying out this invention, an air-tight piston is fitted into the upper portion of a vertical tube, which is open at both ends, and the piston is connected by means of a rod with a valve of the same area in cross section, by which the lower end of the tube may be closed. This rod projects a short distance above the piston, and terminates in a flat disc, fixed horizontally, for the purpose of supporting weights.

The inlet-pipe is connected with the vertical tube at a point about midway between the piston and valve, so that whatever pressure is conveyed by the inlet, it is communicated equally to piston and valve, and the two forces being in opposite directions, and equal to one another—the area of piston and valve being identical—the valve is always maintained in a state of equilibrium, no matter how great or how small the pressure conveyed by the inlet.



The lower end of the vertical tube is inserted into an air-tight chamber from which the outlet proceeds, and in such manner as to allow of the valve opening to its fullest extent without coming in contact with the bottom or sides of the chamber. Now, if the equilibrium be destroyed by placing weights upon the disc at the upper end of the piston-rod, the piston and valve will descend together, the liquid or fluid will flow through the valve opening into the chamber, and this opening will continue to increase in area as the valve descends, until the pressure, which will gradually accumulate in the chamber, exerts an upward force on the valve equal to the downward force exerted by the weight on the disc, when equilibrium will again be restored. Should the outlet opening be now increased, the pressure in the chamber will be diminished, and the upward force against the valve being less than the downward force of the weight on the disc, the valve will descend until its area of opening is large enough to restore the former pressure, when there is again equilibrium. Should the outlet be now closed entirely, the pressure in the chamber will increase, and the upward force against the valve being greater than the downward force of the weight on the disc, the valve will be forced upwards until it is closed entirely; for so long as the valve is open, be it ever so little, the fluid which escapes will exert an upward pressure until it closes the valve. The pressure in the chamber, which is always the same as that of the outlet, is thus regulated at pleasure by the number of the weights placed upon the disc; thus if the area of the valve be 1 square inch, and it be desired to maintain a pressure, at the outlet, of 40 lbs. on the square inch, the weight which must be placed upon the disc to produce this pressure will be 40 lbs.

A valve, constructed as above described, may be adapted for use with steam, water, air, or gas, the principle of construction remaining the same, though the details will depend upon the object for which it is desired to use the valve.

3528.—ROBINSON, C. S., Leicester, "Improvements in burners for burning a mixture of gas and atmospheric air." Patent dated Sept. 8, 1876.

This invention has for its object the construction of Bunsen or atmospheric air and gas burners in such a manner, that the quantity of atmospheric air admitted to the burner shall be better proportioned to the quantity of gas consumed than is usually the case, and that the emission of gas and admission of air shall be effected at one operation by the partial turning of the handle of the gas-cock, which is so arranged as to serve as an air-valve as well.

The invention consists in forming a chamber, in which is fixed the barrel of a gas-cock, the connection extending to it below the chamber, so as to allow of it being screwed on to any ordinary gas-fitting. Into the top of the barrel of the cock is screwed a gas-burner, which extends a little above the chamber, and this burner is enclosed in a tube open at the top, and some 4 or 5 inches (more or less) in length. In the front of the chamber three holes are cut, through the centre one of which the plug of the cock passes into the barrel. Between the handle and the plug is fixed a disc, which, when the gas is entirely shut off, closes the air way to the chamber; but, as the disc is furnished with two holes, the partial turning of the handle will cause the holes in the disc to gradually correspond with the holes in the chamber, and thus admit the free passage of air. It will be seen that by properly arranging these holes the amount of gas emitted and the quantity of air admitted into the combustion-tube may be very nicely proportioned by the one operation of turning a single handle.

A modification of the foregoing consists in placing the gas-cock below the chamber, and attaching to the plug a disc which, on the handle being partially turned, either opens or closes a hole in the chamber.

Another modification consists in making the upper part of the plug nearly as large in diameter as the chamber in which it works, the chamber having a slot in it, through which the handle to the plug passes. An indent is cut in the plug corresponding to the slot, so that when the handle is partially turned, the opening or free way for air into the chamber is opened or closed in proportion to the gas emitted from the burner.

A further modification consists in dispensing with the chamber, as before described, by lengthening the combustion-tube below the gas-burner sufficiently to permit of slots being cut in the said tube, one to allow of the passage of the handle, and the other two for the admission of air. In this case the combustion-tube has an inner sleeve attached to the plug, and has two slots in it corresponding to those in the outer tube. Being fixed to the sleeve, the handle will, on being partially turned, produce the same effect as before described.



FIG. 1.

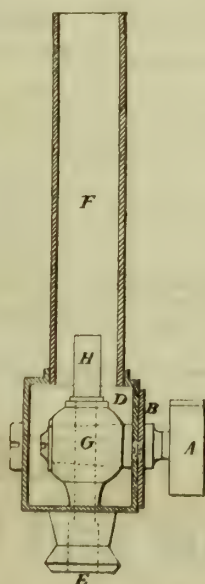


FIG. 2.

Fig. 1 is a front elevation of the arrangement of the burner first described, A being the handle of the cock, and B the disc having air-holes, C, C, which correspond with holes of the same size in front of the chamber, D; E is the inlet for gas; and F, the combustion-tube.

Fig. 2 is a side elevation, the chamber, D, and combustion-tube, F, being in section, for the purpose of showing the internal arrangement. The gas enters at E, and passes through the cock, G to the burner, H; at the same time air enters through the holes, C, in the disc, B, and through the holes, I, in the front of the chamber, D. It will be seen that on turning the handle, A, the gas and air ways are opened or closed at the same time in

equal proportions. [Other modifications are shown in the drawings attached to the specification.]

The construction of Bunsen or atmospheric air and gas burners so that the turning of a handle opens or closes both the gas and air ways at the same time is not new, but the arrangement of the various parts, as described and shown on the drawings, whereby greater convenience is secured, is new.

3547.—WEBBER, C. E., Knightsbridge, "Improvements in the manufacture of, and mode of utilizing, gas for heating or other purposes, and in the apparatus or means employed therein." Patent dated Sept. 9, 1876.

This invention relates more particularly to improvements on the invention for which letters patent were granted to Joshua Kidd, Feb. 13, 1875 (No. 531), and has for its object the improving the heating quality of the gas, and rendering the apparatus employed for generating and utilizing such gas more efficient in its action.

According to this invention, the tall, narrow, cylindrical feeder described in the specification of Kidd's patent is replaced by a shorter feeder of larger diameter, such feeder terminating below in an inverted truncated hollow cone, which may or may not project into the body of the gas generator itself. Into the lower or smaller part of this hollow cone is fitted a solid valve-plug, consisting of two cones placed base to base, the lower cone being shorter and more obtuse than the upper one. This valve is opened and closed by a rod or handle projecting above the cover of the feeder; upon the feeder there is fitted a hopper for charging the same with fuel, a sliding door being provided in the lower portion of the hopper, on a level with the cover of the feeder.

The use of the sheet-iron cylinder or frustum of a cone inside the furnace is dispensed with, and the gas outlet, which is capable of being more or less contracted at will, is placed either at the top or side of the furnace, as found most convenient. The fire-grate is contracted considerably, by sloping inwards the sides of the furnace at the lower part, whereby the action on the fuel of the mixture of steam and air is centralized. The capacity of the closed ash-pit, or mixing chamber, is increased by substituting for the moveable door heretofore proposed a cylindrical ash-pan, forming a close cap or cover to the mouth of the ash-pit, and capable of ready attachment and removal by the aid of a bayonet or similar joint. By the use of this ash-pan a more convenient receptacle for any ashes that may fall from between the grate-bars is not only obtained, but by increasing the capacity of the mixing chamber, a more complete admixture of the air and steam in such chamber, before entering the furnace, is secured. The water is supplied to the coil of pipe inside the gas generator from a water accumulator, in which a pressure of from 30 lbs. to 60 lbs. per square inch is maintained by the aid of a force pump or pumps.

It is further proposed to combine two of these gas generators, and to work them alternately with steam and air, and with steam alone. For this purpose the coils of both the generators are connected with the same water accumulator, and so soon as steam has been generated, and the fuel in one of the generators is found to be in an incandescent state, the steam jet is turned off for a moment, and so plugs up or temporarily closes the short air induction-pipe as to prevent the admission of air along with the steam jet into the ash-box, after which the steam jet is turned on again, by which method of working, gas of much higher heating power is obtained, consisting mainly of hydrogen and carbonic oxide with a small proportion of carbonic acid and other gases. If desired, this gas may be collected separately, or it may be conveyed into the same pipe or gasholder as the gas which is simultaneously produced by the second generator, thus improving the quality of the gas by decreasing relatively the proportion of nitrogen contained in it. It will be found that, by this mode of working, the intensity of the fire will be rapidly lowered, and, therefore, when this reaches such a point as to be no longer capable of readily decomposing the steam passed into it, the steam jet should be turned off, the air induction-pipe opened to admit air as well as steam, and the fire be then supplied with air and steam together, as heretofore proposed. The second generator in the meantime is operating with its air induction-pipe closed, so as to prevent the admission of air thereto, and is supplied with steam alone, as above described, and so on alternately, each generator being supplied in turn with steam and air and with steam alone.

In utilizing the gas produced, it is proposed to consume or burn it at the end of a contracted pipe, or through jets under the pressure obtained in the generation of such gas, or derived from an ordinary gasholder, or other well-known means. The gas may be consumed in its heated state as it issues from the generator, or it may be first cooled by passing through a series of pipes, or other convenient or well-known cooling arrangement. The proportion of air necessary for combustion should be capable of adjustment or regulation, and be induced by the pressure of the gas acting in a burner specially devised to ensure complete admixture of the gas and air previous to combustion. This peculiar burner consists of a cylindrical or other shaped chamber, open at the lower end, and surrounding and enclosing the gas-jet nozzle. A pipe of smaller diameter, but larger than the gas-jet nozzle, and constituting the actual burner, is fitted into the centre of the closed top of the said chamber, in a line with, but some distance above, the mouth of the gas-jet nozzle. This pipe may have a contracted opening.

By reason of the large dimensions of the chamber as compared with the diameter of the burner, the gas and air will be more intimately mixed in the said chamber before issuing through the contracted burner, at the top of which, whether contracted or otherwise, outside the chamber, the said mixture burns with intense heat, and by reason of the due proportion between the diameters of the gas nozzle of the burner the quantity of air necessary for due combustion will reach the gas.

#### APPLICATIONS FOR LETTERS PATENT.

- 233.—THOMAS, H., Oldham, Lancs, "Improvements in gas-meters." Jan. 18, 1878.  
 240.—HUGHES, E. T., Chancery Lane, London, "Improvements in electric lamps." A communication. (Complete specification.) Jan. 18, 1878.  
 244.—LIVSEY, J., Westminster, and KIDD, J., Wandsworth, London, "Improvements in the production of combustible gas, and in the enrichment thereof for illuminating purposes, and apparatus therefor." Jan. 18, 1878.  
 260.—CLARK, A. M., Chancery Lane, London, "Improvements in wet gas-meters." A communication. Jan. 19, 1878.  
 286.—COOKE, J., Durham, "Improvements in the construction of rotary engines and pumps." Jan. 22, 1878.  
 290.—PIEFER, C., Dresden and Berlin, "An improved gas motor." A communication. Jan. 22, 1878.

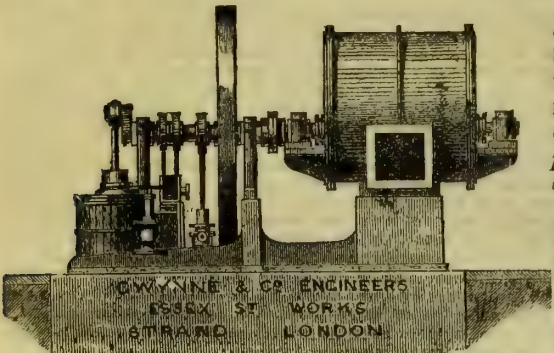
#### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 2842.—WALLACE, R. W., and CLAUS, C. F., Southall, Middlesex, "An improved process for utilizing gas liquor in the manufacture of carbonate of potash and other salts, and sulphuric acid, and in apparatus therefor, which apparatus is also applicable for other like purposes." July 25, 1877.  
 4112.—BRAY, G., Leeds, Yorks, "Improvements in gas-burners." Nov. 5, 1877.



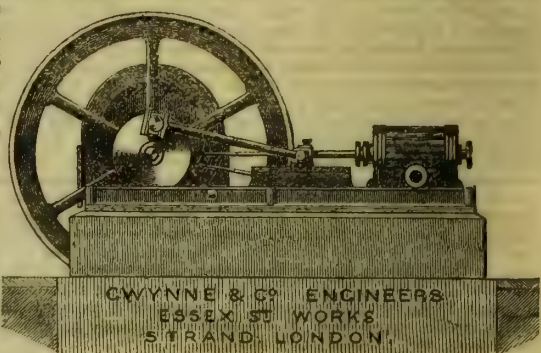
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 Copies, by post, Threepence, direct from the Author, **MAGNUS OHREN, Gas-Works, SYDENHAM, S.E.**

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 John Leigh, Esq., M.R.C.S. F.C.S. &c., &c., in his analytical report of **B. T. & Co.'s Coal** says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

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 years experience in a Gas-Works, desires a **SITUATION.** Is well acquainted with the manufacture and distribution of gas, and has a thorough knowledge of chemistry. Excellent testimonials.  
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**METER, to pass 20,000 cubic feet per hour.** May be seen at work. It is to be disposed of to make room for one of greater capacity.  
 Apply to **E. GODDARD, Gas-Works, IPSWICH.**

**THE Salford Corporation are prepared**  
 to receive **TENDERS** for the erection, at their No. 2 Gas Station, Regent Road, of a **TELESCOPIC GAS-HOLDER,** about 151 feet diameter, with two lifts, each about 40 feet deep.  
 The plans and specification can be seen, and all necessary information obtained, on application to the Engineer, Mr. Samuel Hunter, Gas-Works, Lamb Lane, Salford.  
 Tenders, endorsed "**Tender for Gasholder,**" must be delivered to me, on or before Feb. 12, 1878.  
 The Corporation do not bind themselves to accept the lowest or any tender.  
 By order,  
**CHRIS. MOORHOUSE, Town Clerk.**

**BOROUGH OF NEATH.**  
**THE Gas Committee of the Town Council**  
 hereby invite **TENDERS** for the purchase of the whole of the surplus **TAR and SULPHATE of AMMONIA** to be produced and manufactured at their Works, situate at the Millands, adjacent to the Great Western Railway, Neath, for a period of One, Two, or Three years from the 1st of March, 1878.  
 Sealed tenders, quoting prices for delivery into buyers trucks, at the Gas-Works, to be sent to Town Clerk's Office, Neath, not later than the 27th of February next.  
 Further particulars (if required) may be obtained on application to the Manager, at the Works.  
 By order,  
**ALFRED CURTIS, Clerk to the Committee.**  
 Neath, Jan. 19, 1878.

**HINDLEY LOCAL BOARD'S GAS-WORKS.**  
**THE Hindley Local Board are prepared**  
 to receive **TENDERS** for about 300 tons of 8-inch. and 9-inch. Cast-Iron **GAS-PIPES.**  
 Specifications, quantities, and forms of tender may be had on application to the undersigned.  
 Tenders, endorsed "**Gas-Pipes,**" to be sent to R. Pennington, Jun., Esq., Chairman, Local Board Offices, Cross Street, Hindley, near Wigan, on or before Friday, Feb. 8, 1878.  
 The Local Board do not bind themselves to accept the lowest or any tender.  
 By order,  
**STEPHEN HOLT, Clerk to the Board.**  
 Jan. 24, 1878.

**REMOVAL.**  
**CHARLES HEISCH, F.C.S., Analytical**  
 and Consulting Chemist, Superintending Gas Examiner to the Corporation of London, &c., &c., has **REMOVED** from 8, Savage Gardens, to 79, MARK LANE, where he may be consulted as usual.

**ALFRED LASS,**  
**SPECIAL ACCOUNTANT FOR GAS COMPANIES,**  
**30, GRACECHURCH STREET, LONDON.**  
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*Water Companies Accounts also prepared and adjusted.*  
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**JOHN ROMANS, C.E., F.G.S.E.,**  
**CONSULTING GAS ENGINEER**  
 AND  
**CANNEL COAL FACTOR,**  
**30, St. Andrew Square, EDINBURGH.**  
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Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by **JUDICIOUS INTER-MIXTURE** of the lighter with the heavier gases, much of the rich Hydrocarbons **CAN BE SAVED,** which otherwise **ARE LOST,** during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the **HIGHEST ADVANTAGEOUS RESULTS.**

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## THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 5, 1878.

### Circular to Gas Companies.

It would be difficult to imagine, at all events under present circumstances, a session of Parliament during which the officials of the Board of Trade did not, in some way or other, interfere with the gas interest. What their little game is this year we do not know; but we read that they have a measure in preparation to amend the penalty clauses of the Gas Acts. We do not see exactly what amendment is required; but, probably, the object is to make the recovery of penalties more easy. The Metropolitan Board of Works have seized the opportunity, and applied to the Board of Trade to have it enacted that any forfeitures incurred under the Metropolitan Gas Acts may be paid to the Board, instead of to the Police Fund. We should object to this, if we thought there was any chance of the suggestion being adopted. As it is, the penalties are devoted to the public benefit in the shape of relief to the police-rate. If the money fell into the hands of the Metropolitan Board, it could only be devoted to a similar object within narrower limits. But there is also this difference—in the prosecution of the Gas Companies the Board act as Informers, and modern legislation is entirely opposed to the payment of Informers.

If, however, the Board of Trade are considering any alteration in the law with regard to the Metropolitan Gas Companies, there is one thing we feel bound to insist upon. At present, as our readers know, the certificate of an Examiner, if unappealed against, and the decision of the Chief Gas Examiner in any case, are held to be final and conclusive. To this we strongly object. The Examiner should produce his certificate in Court,

and be there ready for cross-examination. It is only due to the Gas Companies, who have, as a rule, independent Gas Examiners, that they should be made aware of the times at which the official experiments are made, the hours not being now fixed. It is due also to the public that they should be informed on some points of interest. Gas-testing in the Metropolis is said to be a farce. It may or may not be; but it may easily be made so, and we do not see why the Metropolitan Board should be paid for assisting in playing a farce. The penalties will continue to go to the Police Fund, and the metropolitan public will be as satisfied as ever.

We hope that the Board of Trade will concern themselves with the amendment of the Sales of Gas Act, 1859. This is due both to the public and the Gas Companies. Ever since the publication of the reports of the Astronomer Royal and Mr. Chisholm, we have urged the necessity of an examination of the registering apparatus, as well as the measuring capacity of meters. Hitherto some mechanical difficulties have interfered with the easy detachment of the registering apparatus for independent examination. Mr. Sugg seems, however, to have surmounted this difficulty; and, if meter makers will adopt his suggestion, examination of the wheels, to make certain of their accuracy, will be effected with great facility. The public are extremely sore on the matter of meters. A meter, as we have often said, is a box of mystery to them. Recently the Chartered Company have given great offence by removing meters for verification. We have always advocated the removal of a meter for re-verification every third year. When, however, a meter registers to the satisfaction of the hirers, they have a strong objection to have it removed; but there are two parties to the question. The Gas Company require to be satisfied as well as the consumer, and therefore we shall continue to recommend the regular periodical removal of meters for re-verification.

It is quite true that a meter need only be once examined to ascertain the accuracy of the registering apparatus. A meter works so softly and smoothly that there is little probability of a broken cog, so that practically only the registering apparatus of new meters need be examined. For such examination the Board of Trade, we hope, will provide. Candidly speaking, we do not care what is to come; long years of experience have forced upon us the conviction that nothing will satisfy a grumbling gas consumer. Give him an accurate meter, give him gas of fair quality at a reasonable price, and he will spoil the effect of all by bad fittings.

Few Gas Companies in the United Kingdom have so well and so cheaply served their customers as the York Company; but a clique in the city always harassed them in every possible way. It was to effect the confiscation of this Company, if we remember rightly, that the original Municipal Corporations (Borough Funds) Bill was introduced. The Bill, in the end, passed in a very different form to that intended by the promoters, and the York Company have been left in comparative peace. They are now in Parliament with a Bill to increase their capital and extend their limits of supply, and some persons in the Corporation have seized the opportunity of attacking the Company. The allegations they make in the drafted petition, which will be found in another column, are for the most part unreasonable and unjust. In past times the Company have conducted their business according to recognized principles; now they seek for no other terms and powers than Parliament have always granted. To expect that anybody of men should consent to a reduction of their profits, and lessen the value of their property, is to expect too much of human nature. Original capital in a Gas Company has always been considered entitled to ten per cent., and that rate of interest will be continued. The Company propose to raise additional capital, at rates which have been fixed by Lord Redesdale, and inexorably enforced. No doubt the Bill will be amended in Committee, for the Company have proposed neither auction clauses nor sliding scale; and Lord Redesdale and Mr. Raikes, if the Examiners do not, will probably insist on the insertion of both. So far as the opposition in the Town Council of York has gone, it has failed, for the proposal to affix the seal of the Corporation to the petition was rejected by a small majority. It was threatened to renew the opposition last night; but up to the moment of going to press we have not heard the result.

We learn with much regret that Mr. Parry, the able Secretary to the Gas Department of the Birmingham Corporation, has been compelled, in consequence of failing health, to resign his appointment. He was formerly connected with the Birmingham and Staffordshire Company, and when the Corporation took over the undertaking, they secured likewise his valuable services. The work of organizing, and welding into one, the services of the two Companies, and the great labour which must have been caused by the protracted disputes between the Corporation of Birmingham and the surrounding Local Authorities, have proved too



much for Mr. Parry, who now retires from his post, retaining, meanwhile, a sort of consulting position. However able his successor may be, all who have been in contact with Mr. Parry will long remember him for his ability and urbanity.

We are happy to see that the Maidstone Gas Company have resolved on making such an extension of their purifying plant as will enable them to keep within more reasonable limits the proportion of sulphur in their gas. It was originally claimed that a smaller purifying space would be required for gas made by Mr. West's method of carbonization. This desirable end does not, however, seem to be achieved, but this tells nothing against Mr. West's plan. The bulk of gas obtained by its adoption is fully equal to that obtained by longer and heavier charges, while the cost of labour is undoubtedly less. Notwithstanding this failure in regard to sulphur, we hope to see Mr. West's system generally introduced in small and medium-sized works.

The fact is notable, that in some parts of the metropolitan gas world there is a revival of a feeling in favour of general amalgamation. Not much has been said about it of late; but, marking the signs of the times, we think we note an increase in the belief that a consolidation of interests will be to the advantage of Companies, in view of certain eventualities. It is quite unnecessary for us, at the present period of the day, to argue in favour of general amalgamation. Every one who has studied the matter must have been convinced that it affords the best means for combating foes, and of effectually competing with rivals. It cannot be said, at the present moment, that gas has a rival; but there is no knowing what may come. The wonders performed by the employment of electricity exceed the wildest imaginings; but electricity has not yet done for light what it has done for sound. On Friday evening last, we heard, in Albemarle Street, Piccadilly, the sound of a bugle played at Southampton. We also heard words shouted into a box, and listened with wonder as they were ground out again a few minutes later. Whether the day will ever arrive when light may be transmitted from London to Southampton, or *vice versa*, and whether it will ever be possible to lock up light in a box, are questions to which the electricians are certain to devote their attention. The question in the end, however, will always be—Which is cheapest? Here are Gas Companies in possession of the ground, and in a position to fairly compete with any rival light. They can compete on better terms the more they combine and thereby limit their expenses, and, at the same time, hold a better position in the market. As we have often said, we have no fear of the competition of electricity with gas for illuminating purposes for many years. Gas will last our time, with a very limited amount of competition; but it will be well to keep our eyes open to possibilities.

### Water and Sanitary Notes.

A few enthusiastic *doctrinaires* have introduced a Bill to amend the Public Health Act, 1875. It deals solely and simply with the water supply of rural districts, and will carry consternation into the bosom of every parish which is not supplied with water by a Company or a Local Authority. The key-note is struck by the second section of the Bill, which opens as follows:—"It shall be the duty of every Rural Sanitary Authority to see that every occupied house within their district has within a reasonable distance a supply of wholesome water sufficient for the consumption and use for domestic purposes of the occupiers of the house." All that we can say is that Rural Sanitary Authorities may be caused considerable embarrassment if this section should pass into law. We wot of a village in which, for geological reasons, it is impossible to obtain water of less than sixty degrees of hardness, and largely contaminated with sewage matter. Water fit for dietetic purposes has to be fetched from a quarter to three-quarters of a mile, according to the location of the dwelling-house, and a halfpenny has to be paid for a pailful. The supply to such a district is utterly beyond the taxable resources of the neighbourhood and a rural authority to supply the wants of the community, except at rates which must drive the population away from the locality.

The well question is an extremely delicate one. A general attempt to shut up private wells would be certain to encounter a most severe opposition, and Rural Sanitary Authorities especially must be careful how they attempt to put in force such powers as they will possess if this Bill should pass into law. The report of a Medical Officer of Health, that the water from a well or pump is unfit for domestic use, is as nothing when set against evidence that, for generations, there has been no zymotic disease in the house supplied by such well. However, water poison is the cant of the day, and one consequence is this Bill. Supposing the measure to pass into law, which we do not at all anticipate, the

means of defeating its object, apart, of course, from the laudable desire to supply people with pure water, will be very easy, but need not be alluded to now.

Perhaps few projects which have been brought forward within the last quarter of a century have provoked more trashy and sloppy writing than the Thirlmere scheme of the Manchester Corporation. The Cockney tourists, whose pretended interests are mainly studied, but whose taste in art and nature no one knows anything about, would appear, for the moment, to be predominant. Mr. E. Howard has postponed his motion till the second reading of the Manchester Water-Works Bill. We presume that the object of that motion is antagonistic to the scheme of the Manchester Corporation, but we do not imagine that the mover will be successful. Manchester will presently want water, and the Corporation are providently seeking for a supply. That supply they have discovered in Thirlmere, and accordingly to Thirlmere they propose to resort. Not a living soul about Thirlmere will be injured if the project be carried out; while many will be greatly benefited. We always dislike and hesitate to mention names, but Miss Octavia Hill may take care of her lodging-houses in London and elsewhere, and collect her rents, leaving the Corporation of Manchester to do their best for the population who depend upon them. The discussion on the Manchester Bill will be socially the most important in this session. The simple question, put broadly, is, Have the Cumberland and Westmoreland Lakes been created for the gratification of Cockney tourists, or shall the waters they contain, subject to some alterations in the configuration of their shores which may be required, be utilized to slake the thirst and promote the comfort of the teeming populations of the towns and cities of the North of England?

The Committee of the Society of Arts who attend to sewage and health matters, have applied to the Registrar-General to publish some information, which would be extremely valuable if it could be given. The Committee seem to have become alive to the fact, that when the gross death-rate of a town is published, it may greatly mislead as to its actual sanitary condition. Parts may be extremely healthful, and other parts may be very unhealthy. What the unhealthiness may depend upon might be discovered and remedied, if the fact were known. The Registrar-General points out that the proper person to attend to the matter is the local Medical Officer, who should have returns from the Registrar of the district. We believe a charge is made for these returns, which is perfectly unjustified. Every local Sanitary Authority should be regularly furnished with the weekly returns, and, if it be necessary, a small addition may be made to the salary of the local Registrar, for supplying the information.

The Metropolitan Board of Works, with great reluctance, propose a medium course in reference to the prevention of floods in the Thames, a majority of the Members still adhering to the original resolution, which would saddle the Owners and Ratepayers in the districts affected with the cost of the necessary works. They, however, admit to some extent that the decision of the Committee of the House of Commons should be complied with, and they, consequently, intend to introduce a Bill, which, while, up to a certain point, carrying out their recommendations, will nevertheless have the result of fixing the charges of the improvement upon the Owners and Ratepayers, who, it must be admitted, are directly interested. They desire to do all the work themselves, and to charge local rates with the expenditure. This dodge, we are certain, will not answer. The resolution of the Committee of the House of Commons must be strictly adhered to, or thrown aside altogether. What shape the measure proposed will eventually receive, we cannot undertake to say; but we may express a positive opinion, that the prevention of floods in the Thames must be made a Metropolitan question.

### PROVISIONAL ORDERS FOR 1878.

The *Bognor Gas Order* is simply to authorize the Bognor Gas-light and Coke Company, Limited, to raise additional capital to the amount of £8500, the dividend on which is limited to seven per cent.

The *Droitwich Corporation Gas Order*, lodged with the Local Government Board, is to empower the Droitwich Corporation to purchase the undertaking of the Droitwich Gas Company, Limited, and to construct and maintain gas-works for the supply of gas to their borough. The Corporation ask power to borrow not exceeding £5000. Gas having the illuminating power of fourteen sperm candles is to be supplied, and the price not to exceed 6s. per thousand cubic feet.

The *Dysynni Gas Order* is to authorize the Dysynni Gas Company to construct and maintain gas-works for the supply



of Towyn. The capital of the Company is to be £5400, of which £2400 is original and £3000 is additional capital. The Order gives power to borrow the sum of £1250. Gas of fourteen-candle power is to be supplied, at the maximum price of 8s. 4d. per thousand feet. The provisions of the General Act of 1871 are incorporated in the Order, and a testing-place is to be established, the test-burner being Sugg's "London" Argand, No. 1. The Company are required to pay interest on deposits.

The *Elland-cum-Greetland Gas Order* is to authorize the Elland-cum-Greetland Gas Company to raise additional capital to the amount of £35,000, carrying the usual borrowing powers. The new capital is to be offered by auction or tender, subject to the sliding scale. The dividend on the new capital is limited to seven per cent., the standard price of gas being 4s. 6d. per thousand feet. The gas is to have the illuminating power of fourteen candles, tested by Sugg's "London" Argand, No. 1.

The *Formby Gas Order* is to authorize the Formby Gas Company, Limited, to construct and maintain gas-works for the supply of the township of Formby. The capital of the Company is to be £10,000. They are to supply fourteen-candle gas, tested in accordance with the Gas-Works Clauses Act of 1871. The price is not to exceed 8s. per thousand.

The *Godalming Gas Order* is to authorize the Godalming Gas Company, Limited, to manufacture and supply gas to Godalming and the surrounding districts. The original capital of the Company is £23,300, and this Order authorizes them to raise £20,000 additional, the dividends on which are limited to seven or six per cent., according as it is issued. Gas of fourteen-candle power is to be supplied, at a maximum price of 6s.; but fractions of one hundred feet may be charged as one hundred. The testing clauses of the Act of 1871 are incorporated, and the prescribed burner is Sugg's "London" Argand, No. 1.

The *Greenhithe Gas Order* is to authorize the Greenhithe Gas Company to maintain gas-works for the supply of Greenhithe and Swanscombe, and to amalgamate with the Dartford Gas Company. The capital of the Company is to be £10,000, of which £4000 is called original and £6000 additional, the dividends on the latter being limited as usual. The Company are to supply fourteen-candle gas, at the maximum price of 7s.

The *Hoylake and West Kirby Gas and Water Order* is to authorize a Company to construct and maintain works for the supply of gas and water to Hoylake, West Kirby, and the neighbourhood. The capital of the Company is to be £25,000. The undertakers are to supply fourteen-candle gas, at the maximum price of 6s. 6d. per thousand feet, tested by Sugg's "London" Argand, No. 1. The water is to be derived from a well in the parish of West Kirby, the rates being about those ordinarily charged, with the usual extras.

The *Ilkeston Gas Order* asks power to purchase the undertaking of the Ilkeston Gas Company, and for that purpose to authorize the Local Board to borrow on mortgage as much money as may be required. It is proposed to supply fourteen sperm candle gas, the price not to exceed 5s. per thousand cubic feet.

The *Newquay Gas and Water Order* is to empower the Newquay Gas and Water Company, Limited, to construct and maintain gas and water works for the supply of Newquay, Cornwall. The capital is, for the present, to be £8000. Gas having the illuminating power of fourteen sperm candles is to be supplied, at a price not exceeding 7s. per thousand cubic feet. The water is to be taken from a river known as the Adit, and is to be supplied as pure as circumstances will allow. The water-rates to be charged are about as usual.

The *New Tredegar Gas and Water Order* is to empower the New Tredegar Gas and Water Company, Limited, to supply gas to certain parts of the Rhymney Valley. The original capital of the Company is to be £4000, and by this Order they seek to raise £6000 additional capital, the dividends on the latter to be limited as usual. The new Company offer to supply twelve-candle gas at the same price that the Tredegar Gas Company propose to charge for fourteen-candle gas.

The *Saffron Walden Gas Order* is to sanction the acquisition by the Urban Sanitary Authority of the Saffron Walden Gas Company, Limited, and, for this purpose, to borrow money by mortgage on lands belonging to the Corporation. The Corporation are to supply gas of fourteen-candle power, at the maximum price of 7s. 6d. per thousand cubic feet.

The *Sandown Gas Order* is to empower the Sandown Gas and Coke Company to maintain additional works for the supply of Yaverland and Brading (Isle of Wight). The original capital of the Company is £10,000, and this Order empowers them to raise an additional £10,000, carrying the usual borrowing power. The new shares are to be offered by auction or tender, Shareholders to have the preference at equal biddings. The

dividends on the new capital are limited as usual, subject to the sliding scale. The Company are to supply fourteen-candle gas, and the standard price is to be 6s. 8d. per thousand cubic feet.

The *Shanklin Gas Order* is to empower the Shanklin Gas Company, Limited, to raise new capital for the maintenance and construction of additional works for the supply of Brading (Isle of Wight). There are, it seems, three Companies competing for the supply of this delightful little village. The present capital of the Shanklin Gas Company is £10,000, and they seek power to raise another £10,000, carrying the usual borrowing powers. The new shares are to be offered by auction or tender, existing Shareholders to have the preference at equal biddings. It is proposed to limit the dividends on the new capital to the usual rates, subject to the sliding scale. The Company engage to supply fourteen-candle gas, at the standard price of 6s. 8d. per thousand cubic feet.

The *Stratford-on-Avon Gas Order* is to authorize the Stratford-on-Avon Gas Company to raise new capital to the amount of £14,000, carrying the usual borrowing powers. The new capital is to be offered by auction or tender, the existing Shareholders to have the preference at equal biddings. It is proposed that the quality and price of gas shall remain the same.

The *Tow Law Gas Order* is to empower the Tow Law Local Board to increase and extend their gas undertaking. The Order is to authorize them to charge 6s. per thousand feet for fourteen-candle gas, which is a good price for gas in the county of Durham.

The *Walton-on-the-Naze Gas and Water Order* is to empower the Walton-on-the-Naze Gas and Water Company, Limited, to maintain works and supply gas to Walton-on-the-Naze and the environs. The capital of the Company is not to exceed, without further authorization, £21,000. The Company engage to supply fourteen-candle gas, at the maximum price of 7s. 6d.

The *Weston-super-Mare Gas Order* is to empower the Weston-super-Mare Gaslight Company to raise additional capital to the amount of £30,000, carrying the usual borrowing powers. The new capital is to be offered by auction or tender, and existing Shareholders are to have the preference at equal biddings. The dividends on the new capital are limited as usual; the sliding scale is not proposed.

It must be understood that in all these Provisional Orders the Gas-Works Clauses Amendment Act, 1871, is incorporated. Every Gas Company and every Local Authority is required to set up a testing-place, and the prescribed burner is in all instances Sugg's new "London" Argand burner, No. 1.

In all the Acts and Provisional Orders which we have mentioned, the futile provision is made which pretends to regulate the pressure at which gas should be supplied. It prescribes that, under ordinary circumstances, the gas should be supplied from sunrise to sunset, at a pressure of six-tenths of an inch of water, and from sunset to sunrise at a pressure of eight-tenths of an inch of water.

The *Alcester Water Order* is to authorize the Alcester Water Company, Limited, to maintain and continue the supply of water to Alcester and neighbouring parishes in the county of Warwick. The proposed capital of the Company, without further authorization, is not to exceed £2000. The Company design to impound the waters of the stream known as the Rock Mill; they also seek power to sink wells and pump on the old Rock Mill Station. The quality is the best to be obtained under the circumstances, and the rates are as usual.

The *Bush Hill Park Order* is to empower the Northern London Estates Company, Limited, to construct works for the supply of water to Enfield and Edmonton. The source of the water is to be a well sunk in the chalk in the parish of Edmonton, and, therefore, the quality will be just the same as that now supplied by the Tottenham Local Board. The capital of the Company is for the present to be £10,000. The quality of the water is to be the best that can be supplied under the circumstances, and the rates are as usual.

The *Cuckfield, Hayward's Heath, and Lindfield Water Order* is to authorize certain gentlemen, who have formed themselves into a Company, to supply water to Cuckfield and other neighbouring parishes. The source of the water is to be a well in the parish of Westmeston. The capital of the Company is to be £30,000, and the rates are to be as usual.

The *Fowey Water-Works Order* is to empower the Fowey Water-Works Company, Limited, to supply water within the parish of Fowey, in the county of Cornwall. The source of the water is the catchment system in the parish of Fowey. The capital is £3000, and the prescribed quality of the water is the best that can be got under the circumstances.

The *Frith Hill, Godalming, and Farncombe Water Order* is to empower the Frith Hill, Godalming, and Farncombe Water



Company, Limited, to supply water to Godalming and other parishes in the county of Surrey. The source of the water is to be a well in the chalk at Frith Hill, the celebrated sweet water pond, the water of which Mr. Napier proposed to take to Bagshot Sands, being neglected. The capital of the Company is to be £15,000, and the quality of the water to be the best under the circumstances, and the rates are as usual.

The *Holywell and District Water-Works Order* is to empower the Holywell and District Water-Works Company, Limited, to maintain works and supply water to Holywell and surrounding districts in the county of Flint. The source of the water is, of course, to be the celebrated St. Winifred's Well, the excellent quality of which is attested by innumerable crutches, wooden legs, and stretchers left behind by grateful drinkers and bathers.

The capital of the Company is to be £15,000, and the proposed rates for supply are as usual.

The *Norwood (Middlesex) District Water Order* is to empower the Norwood (Middlesex) District Water-Works Company to supply water to Norwood Green, &c., in the county of Middlesex. The source of the water is to be a well in the chalk. The capital of the Company is to be £10,000, and the proposed rates for the supply to be the same as usual.

The *Wokingham District Water Order* is to empower the Wokingham District Water Company, Limited, to supply water to the town and parish of Wokingham, &c., in the county of Berks. The source of the water is to be a well in the chalk in the parish of Wokingham. The capital is £20,000, and the proposed rates for the supply are to be as usual.

# LIGHTING BY ELECTRICITY. (Continued from page 159.)

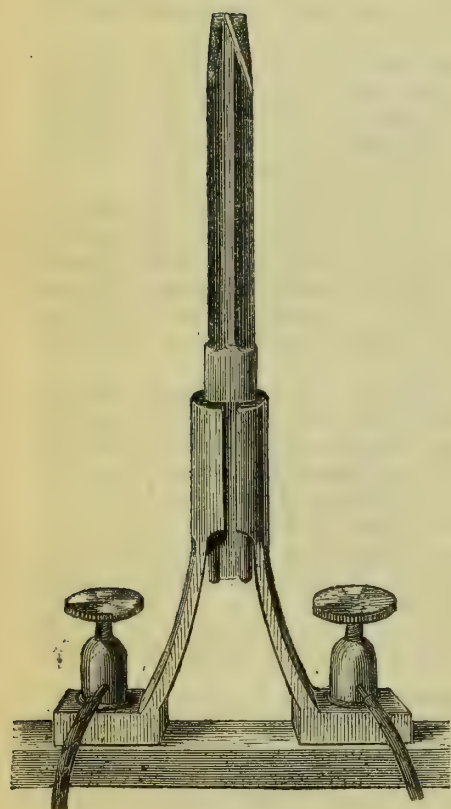


FIG. 15.

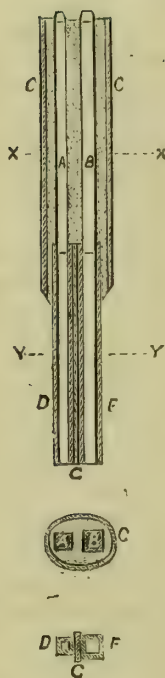


FIG. 16.

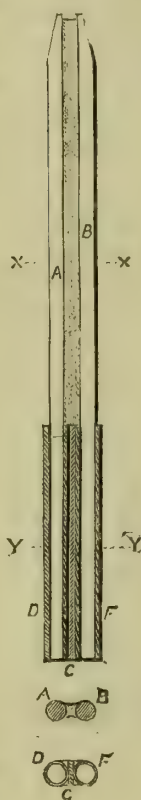


FIG. 17.

In 1876 a patent was applied for by Mr. R. Applegarth, for "Improvements in Electric Light," which he stated was "A communication from abroad by Paul Jablochhoff, of 3, Boulevard Voltaire, Paris." This is the invention of the "Electric Candle," to which so much attention was recently directed. The patent was sealed on the 9th of March, 1877, but is now described as "void by reason of the patentee having neglected to file a specification in pursuance of the conditions of the letters patent."

The provisional specification is as follows:—

This invention consists of the entire removal of all the mechanism generally used inside electric lamps.

Instead of causing the carbon points to approach each other automatically, by means of machinery in proportion as they are consumed, I place them side by side, as shown in the drawing hereto attached, but I place an insulating substance between them, which consumes at the same time as the carbon points; for instance, porcelain, brick, magnesia, or any other insulating substance.

The carbons used by me may be—

1. The ordinary carbon points used for the purposes of electric light.
2. Hollow carbons of different sizes to admit of one being placed inside the other.
3. Carbons made of compressed coal, which are well suited to the tube arrangement before mentioned.

The two carbons thus prepared, are fixed in a stand which may be described as a special candlestick, and a current of electricity, by means of a battery or any other source, is passed through them.

To light the lamp, I join the tips of the carbons by a small slip of carbon, which, on the electric current passing through, produces light.

To prevent one of the carbons consuming more rapidly than the other, I use carbons of different thicknesses to ensure equal consumption of both. I can either place between the two carbon points a piece of the insulating substance, or I can place one or both of the carbon points in an isolating tube or tubes.

If I wish to keep the light in any given spot—for instance, at the centre of a reflector—I can utilize a portion of the electric current to set in

motion clockwork, or to stop it, for the purpose of gradually raising or lowering the carbon points; or I can raise or lower the reflector if necessary.

The drawing attached hereto represents the carbons as parallel to one another, but I reserve to myself the right of inclining them to one another.

Having thus described the nature of this invention, and in what manner the same is to be carried into effect, I claim—

1. The mode of placing the carbons side by side with an isolating substance between them, for the purpose of producing light by passing an electric current through them.
2. The application of this electric light so produced for lighting purposes generally both on land and at sea, and for submarine purposes.
3. The right of producing a coloured light by mixing colouring matter with the insulating substance which separates the carbons.

Attached to this provisional specification are diagrams which give an idea of the principle of the invention and its modifications, but the annexed drawing (fig. 15) of the "Electric Candle" and its appurtenances embodies the practical arrangement, with the exception that the three elements are made to form a round section instead of a rectangular one. The carbons here are seen to be divided by a piece of porcelain; but when, in February, 1877, M. Jablochhoff took out a patent in his own name (No. 494) for what is substantially an improvement in his candlestick, he describes his invention as "Improvements in Electric Lamps, and in Arrangements connected therewith for Dividing and Distributing the Electric Light." Practically the candle remains the same as described in Applegarth's provisional specification, with the exception of the insulating material suggested being in the form of powder instead of "solid substances, as is the case when kaolin or porcelain is used." He says: "A powder, which I find serviceable, consists of one part of lime, four parts of sand, and two parts of talc."

The drawings attached to his specification are similar to those here



given. Fig. 16 represents a vertical section, with sectional plans, at X and Y respectively, of the form of Electric Candle according to this invention:—

A and B are the two rods of carbon, which are pointed at the upper end, and of which the one, B, which is to receive the positive current of electricity, is made larger than the other, A, to allow for its more rapid consumption; these rods are placed parallel to each other in a case or cartridge, C, made of asbestos card, or paper. The space within the cartridge surrounding the rods, A and B, is filled with one of the powders mentioned above, the constituents of which are thoroughly mingled, so as to get a uniform mixture. When the cartridge is filled the mouth is stopped by a paste of silicate of potash. To conduct the electricity to the carbon rods their lower ends are inserted in tubes, D and F, of copper or other good conducting metal, which are insulated from each other by a strip, G, of asbestos card.

Fig. 17 represents a vertical section of one form of candlestick suitable for the electric candle above described. The tubes, D, F, of the candle are gripped between two insulated vice-jaws, H, J, worked by screws, K, L, and having pinching-screws, N, P, for the + and - wires electrically connected to F and D respectively; M is a base or stand of wood, or other non-conducting material, from which extends supports of a gallery, R, to hold an opal or coloured glass globe, S.

The construction of the candle may be varied, as, for example, in the manner shown by the vertical section and the sectional plans, taken at X and Y respectively. In this case the carbon rods, A and B, and tubes, D and F, are round, the former, instead of being contained in a cartridge, being merely separated by a partition of kaolin or other similar insulating material.

Referring again to M. Fontaine's book, from which we have already quoted some lengthy extracts, we make the following translation from his last chapter, on "The Divisibility of the Light." He says:—

We have already spoken of the parallel carbon "candles" of M. Jablochhoff; it only remains now to give a few particulars as to the experiments actually made at the *Grands Magasins du Louvre*, and as to the note presented by M. Denayrouse to the Academy of Sciences, on the 17th of April last.

M. Jablochhoff's apparatus was fitted up at the *Magasins du Louvre* with the object of increasing the light in the *Salle Marengo*, situated between two large longitudinal galleries. This central hall was already brilliantly illuminated with gas, not only from its own eleven lustres, but from the surrounding halls on the ground and upper floors, from which it was separated by arcades only. All round the hall, and at about two-thirds of its height, runs an ornamental gallery, upon which the electric lighting apparatus are fixed. Two of the Alliance machines supply six "candles." A small and very ingenious contrivance enables the "candles" to be replaced as fast as they are consumed, without any sensible interruption of the light. The "candles" are surrounded by globes, to soften and diffuse the light, and furnished with reflectors to project it. The "candles" are composed of two carbon pencils, 0.004 of a metre (0.15 inch) in diameter, and 0.12 of a metre (4.72 inches) long, of M. Carré's manufacture, insulated by a plate of siliceous material; they are fixed upon two copper tubes, and fastened together by a tampon of asbestos. A small cylindrical piece of charcoal in communication with the points of the two pencils serves for the lighting of the "candles."

It is difficult to estimate the amount of luminosity obtained from the electric light, because the gas in the hall is never completely extinguished, and the neighbouring galleries furnish a considerable quantity of light; however, by the aid of a pocket photometer, we ascertained that each "candle" had a lighting power of from 20 to 25 burners. There are frequent irregularities in the light, but they are only trifling. A slight unsteadiness is almost constantly observable in all the lights, arising from the nature of the pencils, variations in the speed of the engines, &c., to which must be added a certain movement supposed to be produced by a kind of ebullition of the siliceous material interposed between the carbons, causing the diffusing globe to ring. We are assured that the "candles" will last three-quarters of an hour. At the *Magasins du Louvre* they are replaced every half hour.

The examination of this system of lighting should bear not only upon the visible effects, which any one can appreciate in a few visits, but also, and principally, upon the cost of fitting up and the cost per hour and per unit of light; and, as it is a question of lighting by electricity, it is best to compare it with electrical apparatus actually in operation, such, for instance, as that fitted up at the india-rubber manufactory of M. Ménier, at Grenelle.

Regarded from a purely scientific point of view, M. Jablochhoff's labours are undeniably valuable; they prove that three voltaic arcs may be placed upon a single electric current, and that two parallel carbons, separated by a plate of siliceous material, produce a light much less intense, but quite as regular and not so intermittent as that obtained with a regulator and retort carbons. They prove likewise that the voltaic arc is capable of furnishing a luminous focus much less vivid, and, consequently, more easily fitted up in a small area than that obtained from carbons in opposition.

The possibility of dividing the electric light, either for trials or for scientific demonstrations, has been already proved by the apparatus fitted up in the establishment of M. Florent, at St. Petersburg, with the aid of the Kohn lamp; but the characteristic point of the new experiments consists in the divisibility of the light by means of the voltaic arc in ambient air, while that of M. Kohn's experiments relates to the small wire-ends incandescent in a vacuum. That is all the difference.

It is certain that by continuing his beautiful studies, and thanks to the active co-operation of M. Denayrouse, M. Jablochhoff will succeed in producing the light more economically, and in materially diminishing the expenses of fitting up which his system at present necessitates; but it is not less certain that, with regard to industrial applications, the apparatus fitted up at the *Magasins du Louvre* proves absolutely nothing, unless it is that the new method of lighting shows economical results very inferior to those of ordinary electric lighting.

This may be easily established. The two machines and six candle-holders of the Jablochhoff apparatus cost at least as much as six Gramme machines and six Serrin lamps. The six "candles" give a light equal to 240 Carcel burners; six Gramme machines with Gaudin carbons give 3000 Carcel burners. With equal first cost, a lighting apparatus with a regulator therefore produces twelve times more light than one with a "candle."

Admitting that the two Alliance machines require 3-horse power to drive them, two Gramme machines with the same motive force would

\* There is nothing definite in this figure. We reckoned from 20 to 25 burners per "candle," and requested two persons to verify our estimate; one reckoned 22 burners, the other 30. However, as it is very difficult to take exact measurements, we should not have been surprised at having put down too low a figure. Under all circumstances, we admit 40 burners per "candle," at the same time calling attention to the fact that even by doubling this number the conclusion resulting from our comparison would not be in any way modified.

produce 1000 Carcel burners in place of the 240 produced by the six "candles." There again the advantage is considerably in favour of lighting by means of a regulator.

But it is especially when we compare the consumption of the carbon points that the superiority of the old system becomes apparent. An electric "candle" that lasts half an hour costs at least 50 centimes, which is equal to one franc per hour for 40 burners, and to 12 fr. 50 c. (about 10s. 6d.) per hour for 500 burners. Now the same amount of light is produced at M. Ménier's establishment at Grenelle with 25 centimes worth of ordinary carbon pencils. The outlay for carbons is, therefore, fifty times greater by the use of the "candle" than by the use of the regulator.

We cannot too often repeat that M. Jablochhoff will soon succeed in rectifying, in a certain degree, the discrepancies we have pointed out. The Alliance machines are dear, but it is possible to make them more cheaply, and the "candles" are equally susceptible of being set up much more economically. The only fact upon which we desire to insist is that it is actually materially impossible to replace with advantage regulators by "candles."

The trial made in the *Grands Magasins du Louvre* is a very interesting one; it attracts a crowd, the papers speak highly of it, and, if it is not absolutely practicable, it does not the less deserve to engage public attention as the germ of a great progress that will perhaps bear fruit in a not distant future.

Finally, it is impossible to draw any conclusion, favourable or unfavourable, from this trial; it is perhaps a step towards the solution, but assuredly it is not the solution. The result obtained shows especially the difference in the colour of the electric light and that of gaslight. It is very nearly what was noticed a few years since upon the Boulevard des Italiens, when M. Tessié du Motay was making some experiments with oxyhydric gas.

The note presented to the Academy by M. Denayrouse relates to the entire suppression of carbons in the production of the electric light. M. Jablochhoff thought of introducing into the central circuit of an electromagnetic machine the interior wire of a series of induction coils, and causing a spark to pass on to a plate of kaolin simply placed between the two extremities of the exterior wire of each coil. This interposed plate of kaolin is heated, becomes red hot, and eventually luminous. The electric current first of all passes on to a priming of greater conducting power placed upon the edge of the plate of kaolin. By this means M. Jablochhoff hopes to succeed in producing 50 luminous focuses with a single magneto-electric machine. This is exactly what Mr. King and MM. Lodyguine, Kohn, Kosloff, and De Changy also hoped to do. May M. Jablochhoff be more fortunate than his predecessors. We most heartily wish him success.

(To be continued.)

**PRESENTATION TO MR. S. E. STEVENSON.**—On Thursday, the 24th ult., the *employés* of the Exeter Gas Company presented Mr. and Mrs. Stevenson, on the occasion of their marriage, with a handsome silver kettle and stand, with a suitable inscription, also an illuminated address, in token of the respect and esteem in which Mr. Stevenson is held as Engineer of the Gas Company.

**RAMSGATE GAS AND WATER WORKS.**—It is with pleasure we learn that Mr. W. A. Valon, under whose management the Gas Company's undertaking became so prosperous as to form an irresistible temptation to the Local Board, has just received the appointment of Engineer to both the gas and water works, which on the 23rd ult. became the property of the Corporation; and we congratulate the Local Board on the wisdom they have shown in confiding their interests to a gentleman of such acknowledged ability and experience as Mr. Valon.

**BIRMINGHAM CORPORATION GAS DEPARTMENT.**—We are informed that Mr. Henry Parry, who has been Secretary to the Gas Department since its constitution, has resigned his appointment; his health having proved unable to bear the strain of the heavy duties of the office. Mr. Parry was formerly Secretary to the Worcester Canal Company, and to the West Suburban Railway, in both of which capacities he was much appreciated by the Directors. He was then appointed Assistant Secretary to the Birmingham and Staffordshire Gas Company, and when the Company's business was transferred to the Corporation, he became sole Secretary to the Gas Department. In this office he has earned a just reputation for assiduity and courtesy, but the great labour imposed by the reorganization and extension of the office has proved too much for his physical strength, and he is obliged to seek a lengthened term of rest in order to recruit his health. Those who have occasion to transact business with Mr. Parry, will very much regret the cause of his retirement, and will be glad to learn that he has benefited by repose. We have also to announce that the Gas Committee have appointed Mr. Edwin Smith, Secretary to the Midland Institute, as Mr. Parry's successor in the secretaryship of the department. The Institute will suffer by Mr. Smith's removal, but the appointment is an excellent one for the town, for Mr. Smith's energy, courtesy, and remarkable organizing and administrative capacity—which have been proved for a long series of years at the Institute—specially fit him for the important office for which he has now been selected. Mr. Parry, we believe, retains for a time a consulting connection with the department.—*Birmingham Daily Post*.

**HANDSWORTH WOODHOUSE GAS COMPANY, LIMITED.**—The annual meeting of Shareholders was held on the 28th ult.—Mr. William Hooley, the Chairman, presiding. The balance-sheet for the year ending Dec. 31, 1877, showed a balance of profit amounting to £255 18s. 7d. The Directors proposed to pay out of this a dividend at the rate of 7½ per cent. for the year, which would absorb £209 8s. 3d.; also that £20 from the balance be added to the reserve-fund, which would then amount to £255 8s. 10d. invested in the South Yorkshire Building Society. They had likewise resolved to make a reduction of 5d. per 1000 cubic feet of gas, commencing on the 2nd of April. The price to all consumers would then be 4s. 7d. per 1000. The report and balance-sheet were unanimously adopted, the dividend to be paid on the 4th inst. The retiring Directors were re-elected; also the Auditors of the Company. The usual votes of thanks concluded the meeting.

**CLEVELAND WATER COMPANY.**—The nineteenth half-yearly general meeting of Proprietors was held in the Company's office, Milton Street, Saltburn-by-the-Sea, on Friday, the 1st inst.—John Thomas Wharton, Esq., Chairman of the Company—in the chair. It was resolved—"That the report of the Directors, which has been circulated amongst the Proprietors, be received and adopted. That a dividend at the rate of 9 per cent. per annum on the original and A shares, and 6 3-10ths per cent. per annum on the B shares (free of income-tax), be now declared for the half year ending on the 31st of December last, and be paid to-morrow to the Proprietors now registered in the books of the Company. That Mr. Henry Fell Pease, of Darlington, be elected a Director of this Company, in the place of Mr. Robert Thompson, who does not seek re-election, and that Mr. Robert Gill be re-elected a Director of this Company. That Mr. J. C. Simpson be re-elected as one of the Auditors of this Company."



A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND  
DISTRIBUTION OF COAL GAS.

CLVII.

PUBLIC LIGHTING (*continued*).

In figs. 1 to 8 we give illustrations of various designs of street-lamp columns and lanterns, and in fig. 9 an engraving of a standard for wall or gate-post.

The ordinary wrought-iron wall-bracket, which is best suited to general street purposes, is shown in fig. 10. We do not agree with the opinion sometimes expressed, that it is ugly in design, and that something more ornamental is desirable. It has cheapness to recommend it; and although it has a work-a-day appearance, it is none the worse for that. In the majority of streets anything more ornate would be out of place. A few examples of brackets of more elaborate design are given in figs. 11, 12, 13 and 14.



A. HANDSIDE AND CO.

FIG. 1.

R. DEMPSTER AND SONS.

FIG. 2.

PARIS COLUMN AND LAMP.

FIG. 3.

G. BOWER.

FIG. 4.

W. T. ALLEN AND CO.

FIG. 5.



The service-pipe from the main to the foot of the lamp-column, or to the wall against which a bracket is fixed, should be not less than three-quarters of an inch internal diameter; the stand-pipe against the wall, and within the column, being diminished by means of a T-piece to half an inch in diameter. The method of attaching the service and stand-pipe is exhibited in fig. 15.

Lamps are supported in position either by means of the holder or basket, fig. 16, or by the chair, fig. 17, both of which are secured to the top of the column. In the former case the lamp is placed within the frame, and is suspended by the eaves. In the latter, four spurs, a quarter of an inch thick, and 1 inch long, project from the corners of the lamp bottom, and pass through corresponding holes in the chair, and, being screwed, are secured by nuts underneath. The framework of the lamp basket should be made as light as possible, and the side rods should come behind the lamp frame, otherwise they will increase the shadows projected upon the ground. The holder is sometimes made with only one arm, as in fig. 18. In this case the single arm requires to be proportionately stronger—say three-quarters of an inch in diameter—to support, unassisted, the weight of the lamp bearing upon it.

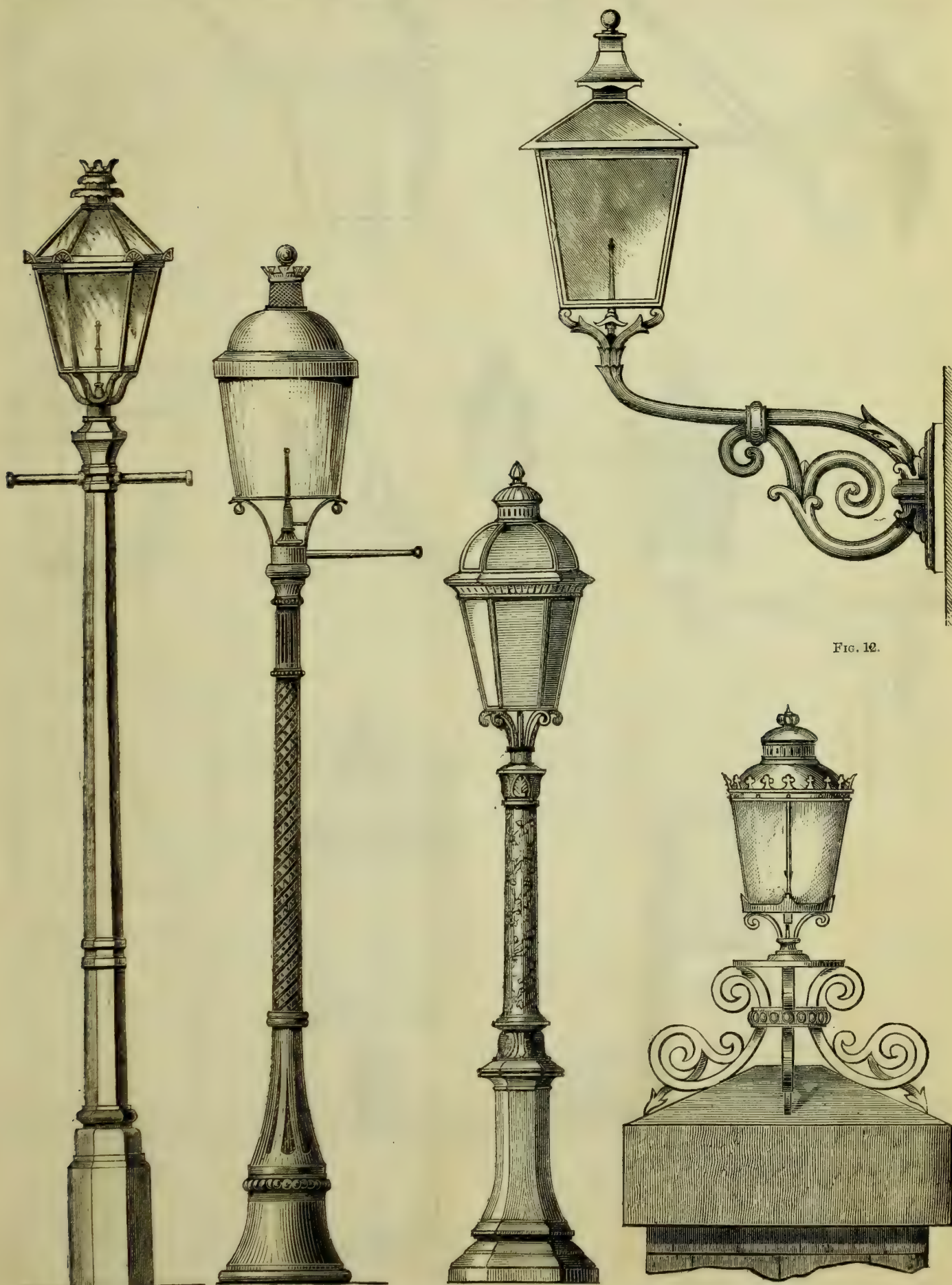


FIG. 12.

D. HULETT AND CO.

FIG. 6.

W. SUGG.

FIG. 7.

DWARF PILLAR—W. T. ALLEN &amp; CO.

FIG. 8.

W. T. ALLEN AND CO.

FIG. 9.



PUBLIC LIGHTING (continued).

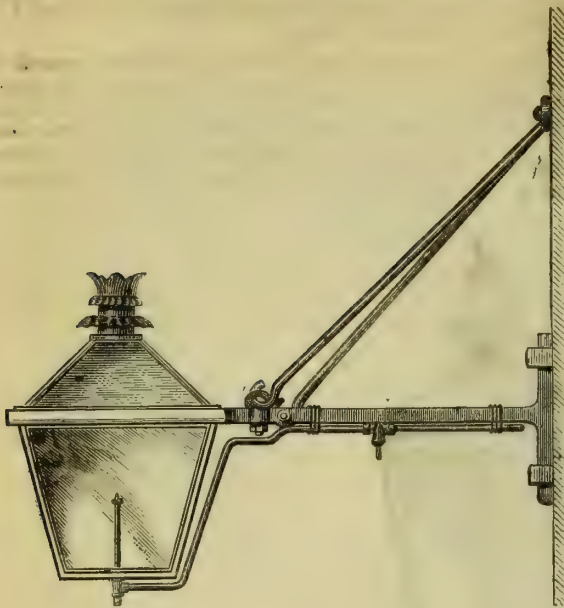
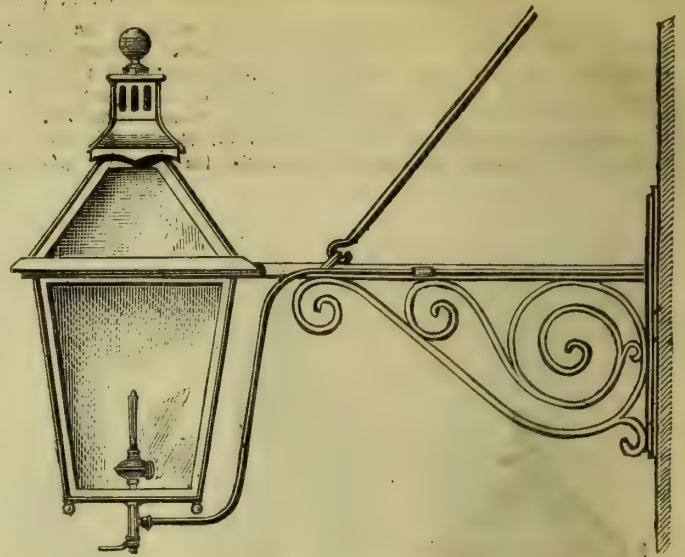


FIG. 10.



W. SUGG.—FIG. 11.

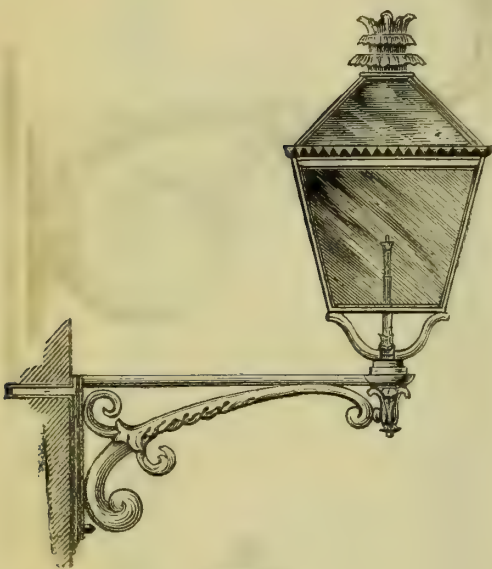


FIG. 13.



W. T. ALLEN & CO.  
FIG. 14.



FIG. 16.

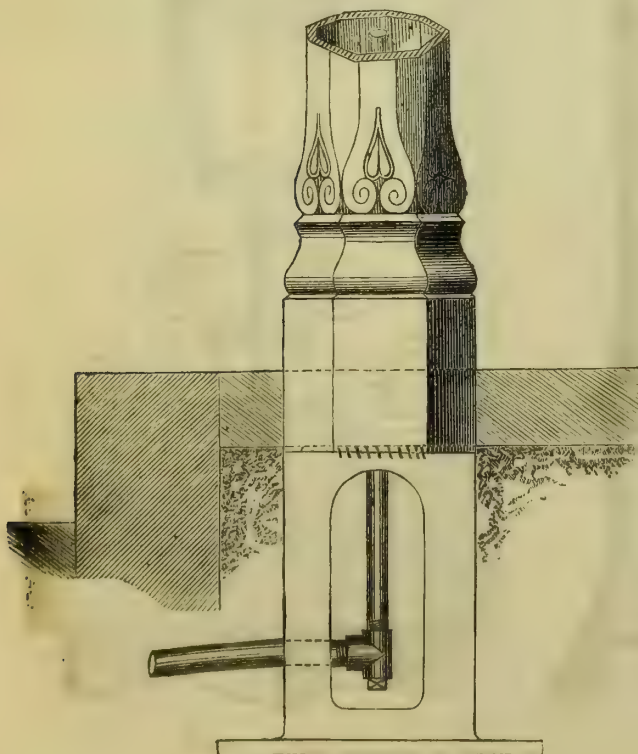


FIG. 15.

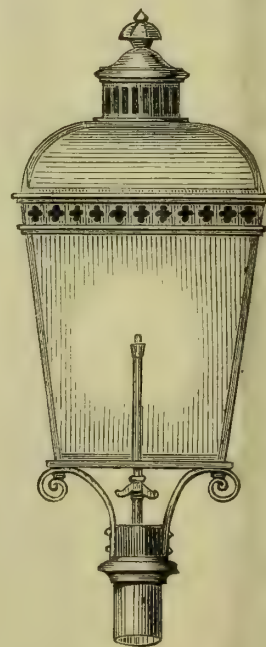


FIG. 17.

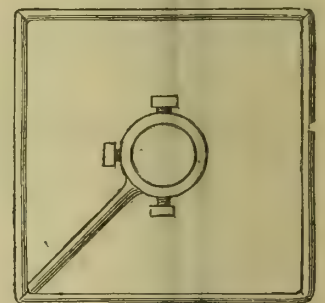


FIG. 18.



## Parliamentary Intelligence.

## HOUSE OF LORDS.

MONDAY, JAN. 28.

The Examiners reported that the Standing Orders applicable to the following Bills have been complied with:—Brading Harbour District Gas; Dore Water; Exeter Corporation Water; Exeter Gas; Hemel Hempstead District Gas; Imperial Continental Gas Association; Lea Bridge District Gas; South Hants Water; Sutton-in-Ashfield Gas.

Bills read the first time, and ordered for second reading:—Batley Corporation Water; Dublin Corporation Water-Works Acts Amendment.

Bills read the first time, and referred to the Examiners:—Castleford and Whitwood Gas; Normanton Gas; South Staffordshire Water; York United Gas.

TUESDAY, JAN. 29.

The Examiners reported that the Standing Orders applicable to the following Bills have been complied with:—Clitheroe Gas, Water, and Improvement; Forfar Water; Hamilton Burgh; Lewes Gas; Newry Gas; Trowbridge Water: and that the further Standing Orders applicable to the Deal Water Bill have been complied with.

Bills read the first time, and ordered for second reading:—Exeter Corporation Water; Sutton-in-Ashfield Gas.

Bills read the first time, and referred to the Examiners:—Exeter Gas; Imperial Continental Gas Association.

THURSDAY, JAN. 31.

The Examiners reported that the Standing Orders applicable to the following Bills have been complied with:—Bangor Water and Gas; Bedlington Local Board (Water); Bournemouth Gas and Water; Castleford Local Board; Dalton-in-Furness Local Board; Hartlepool Gas and Water; Leicester Corporation; Lichfield Gas; Mansfield Commissioners Gas; Maryport Improvement; Newbury Borough Extension; Stoke-upon-Trent Corporation Gas; Torquay Gas; Tredegar Water and Gas; Warrington Water; Weston-super-Mare Improvement Commissioners.

Bills read the first time, and ordered for second reading:—Clitheroe Gas, Water, and Improvement; Forfar Water.

Bill read the first time, and referred to the Examiners:—Trowbridge Water.

FRIDAY, FEB. 1.

The Examiners reported that the Standing Orders applicable to the Scarborough (Corporation) Water Bill have been complied with.

Bills read the first time, and ordered for second reading:—Leicester Corporation; Newry Gas.

Bills read the first time, and referred to the Examiners:—Lichfield Gas; Warrington Water.

Bills read a second time:—Batley Corporation Water; Deal Water.

## HOUSE OF COMMONS.

MONDAY, JAN. 28.

The Examiners reported that Standing Order 62 has been complied with in the case of the Nottingham Water Bill.

The petitions were presented for the following Bills, which were ordered to be brought in:—Brading Harbour District Gas, by Mr. Grantham and Mr. Alfred Marten; Farnworth and Kearsley Gas, by Mr. Hardcastle, Mr. Hick, and Mr. John Cross; Hemel Hempstead District Gas, by Mr. Cowper, Mr. Abel Smith, and Mr. Halsey; Lea Bridge District Gas, by Colonel Makins and Sir Henry Selwin-Ibbetson; Manchester Corporation Water, by Sir Thomas Bazley, Mr. Birley, Mr. Jacob Bright, and Mr. Hardcastle; Truro Water, by Sir Frederick Williams and Sir James M'Garel Hogg.

Bill read the first time, and ordered for second reading:—Bradford Water and Improvement.

Bill read the first time, and referred to the Examiners:—Cardiff Water.

A petition against the Nottingham Water Bill was presented from the Corporation of Nottingham.

## METROPOLIS WATER-WORKS (PURCHASE) BILL.

Colonel BEESFORD asked the Secretary of State for the Home Department whether he would use his influence to postpone the consideration of the Bill promoted by the Metropolitan Board of Works for the purchase of the Water Companies at a cost of many millions sterling, until that Board had, in accordance with the spirit of his recent reply to the Board, taken the necessary steps to prevent the recurrence of floods on the Surrey side of the water.

Mr. CROSS said he did not see what right he had to adopt the course suggested by the honourable and gallant gentleman. He might, however, take that opportunity of stating that he had received from the Metropolitan Board of Works, in answer to a letter which he had sent to them some time ago, a communication which induced him to hope that the arrangements they intended to make on the subject would be satisfactory.

TUESDAY, JAN. 29.

The Examiners reported that Standing Order 62 has been complied with in the case of the Cheltenham Water Bill.

The petitions were presented for the following Bills, which were ordered to be brought in:—Hamilton Burgh, by Mr. Ramsay, Sir Edward Colebrooke, and Sir Windham Anstruther; Lewes Gas, by Mr. Gregory and Mr. Christie.

Bills read the first time, and ordered for second reading:—Brading Harbour District Gas; Manchester Corporation Water.

Bills read the first time, and referred to the Examiners:—Hemel Hempstead District Gas; Lea Bridge District Gas; Truro Water.

Bill read a second time and committed:—Cockermouth and Workington Water.

## MANCHESTER CORPORATION WATER BILL, AND THE WATER SUPPLY OF LANCASHIRE AND YORKSHIRE.

On Thursday, Jan. 17, Mr. Edward Howard gave notice that to-day he would move for a "Select Committee to inquire into the supply of water to the manufacturing districts of Lancashire and the West of Yorkshire, and any deficiencies likely to arise therein; and whether it is necessary or expedient to resort to the Westmoreland and Cumberland Lakes to make good any deficiencies in such supply; and, if so, to what extent, and under what conditions, such resort should be sanctioned."

On its being called on,

Mr. HOWARD said: In response to the appeal of the Chancellor of the Exchequer yesterday, I gave notice that I would propose this motion as an amendment to the second reading of the Manchester Corporation Water Bill. As that course still seems to be the most convenient to many Members interested in the question, I beg to state that I shall not proceed with this notice now; and at the same time I give notice that, on the second reading of the Manchester Corporation Water Bill, I shall feel it my duty to move—"That it be read a second time upon this day six months." Should the House accept my motion, I shall, as soon as I can afterwards get an opportunity, propose a resolution similar to that which stands in my name for to-night.

WEDNESDAY, JAN. 30.

The petition was presented for the South Hants Water Bill, which was ordered to be brought in by Mr. Mundella and Mr. Rodwell.

Bill read the first time, and referred to the Examiners:—Lewes Gas.

Bills read a second time and committed:—Bangor Local Board; East Retford Borough; Marske and Saltburn Gas; Metropolis Water Supply.

Petitions were presented against the Manchester Corporation Water Bill, from (1) Thirlmere Defence Association, (2) Owners, &c., in the neighbourhood of proposed works.

THURSDAY, JAN. 31.

The petitions were presented for the following Bills, which were ordered to be brought in:—Bangor Water and Gas, by Mr. Hughes and Mr. Morgan Lloyd; Bournemouth Gas and Water, by Mr. Ashley and Mr. Gorst; Dalton-in-Furness Local Board, by Mr. Stanley and Colonel Clifton; Hartlepool Gas and Water, by Mr. Bell and Mr. Pease; Newbury Borough Extension, by Mr. Walter and Colonel Loyd-Lindsay; Stoke-upon-Trent Corporation Gas, by Mr. Colin Campbell and Mr. Heath; Tredegar Water and Gas, by Mr. Dickson and Mr. Benjamin Whitworth; Weston-super-Mare Improvement Commissioners, by Major Allen and Mr. Richard Bright.

Bill read the first time, and ordered for second reading:—Hamilton Burgh.

Bills read the first time, and referred to the Examiners:—Farnworth and Kearsley Gas; South Hants Water.

PUBLIC HEALTH ACT (1875) AMENDMENT BILL.—This Bill was read a second time, and committed to a Select Committee.

A petition for dispensing with the Standing Orders in respect of the petition for the Nottingham Improvement Gas and Water Bill was presented from John Clarkson Major.

Petitions against the Metropolis Water Supply Bill were presented from (1) Guardians of the Poor of West Ham Union, (2) West Ham Local Board.

FRIDAY, FEB. 1.

The Examiners reported that Standing Order 62 has been complied with in the case of the Cardiff Water Bill.

The following resolutions reported from the Standing Orders Committee were agreed to:—"That, in the case of the Cheltenham Corporation Water Petition, the Standing Orders ought to be dispensed with—That the parties be permitted to proceed with their Bill." "That, in the case of the Nottingham Improvement, Gas, and Water Petition, the Standing Orders ought to be dispensed with—That the parties be permitted to proceed with their Bill."

The Cheltenham Corporation Water Bill was ordered to be brought in by Mr. Agg-Gardner and Mr. Henry Samuelson.

The petitions were presented for the following Bills, which were ordered to be brought in:—Dore Water, by Lord George Cavendish and Admiral Egerton; Maryport Improvement, by Lord Muncaster and Mr. Wyndham; Scarborough Corporation Water, by Sir Harcourt Johnstone and Sir Charles Legard.

Bills read the first time, and ordered for second reading:—Dalton-in-Furness Local Board; Newbury Borough Extension; Stoke-upon-Trent Corporation Gas.

Bills read the first time, and referred to the Examiners:—Bangor Water and Gas; Bournemouth Gas and Water; Hartlepool Gas and Water; Tredegar Water and Gas; Weston-super-Mare Improvement Commissioners.

Petitions were presented against the following Bills:—Manchester Corporation Water, from Mersey and Irwell and Bridgewater Navigation Companies; Metropolis Water Supply, from Charles Vernon Strange; Southport Water, from (1) Justices of the Peace for the County Palatine of Lancaster, (2) Lancashire and Yorkshire Railway Company.

SATURDAY, FEB. 2.

Petitions against the following Bills were presented:—Bangor Local Board, from Bangor Water and Gas Company; Bradford Water and Improvement, from Lancashire and Yorkshire Railway Company; Cockermouth and Workington Water, from (1) Michael Falcon and Mary Falcon, (2) William Parkin, (3) Sharp Braithwaite, (4) Trustees of the District and Harbour of Maryport; Manchester Corporation Water, from (1) Manchester, Sheffield, and Lincolnshire Railway Company, (2) Cheshire Lines Committee, (3) William Walter Bagot and others, (4) Lancashire and Yorkshire Railway Company, (5) London and North-Western and Lancashire and Yorkshire Railway Companies; Metropolis Water Supply, from (1) Uxbridge District Local Board of Health, (2) Vestry of St. Mary, Islington, (3) Vestry of St. John, Hampstead, (4) Benjamin Henry Walpole Way, (5) The Gaslight and Coke Company.

## Legal Intelligence.

BELFAST POLICE COURT.—SATURDAY, JAN. 26.

(Before Messrs. O'DONNELL and ORME.)

ILLEGAL CONNECTION OF GAS-PIPES.

John Smith, plumber and gas-fitter, of Old Lodge Road, was summoned, at the suit of the Gas Committee of the Belfast Town Council, "for that he did, on the 14th of January, 1878, at Belfast, cause to be laid a pipe to communicate with a pipe belonging to the complainants, used for the supply of gas, without their consent, contrary to the statute."

Mr. McLEAN, who appeared to prosecute, said this was the first case of the kind that had been brought since the purchase of the Gas-Works by the Town Council.

James Freeland deposed that he was a labourer in the employment of the Town Council. On Jan. 14 last he examined the gas-fittings on the defendant's premises, in accordance with instructions from the Gas Office, and found an india-rubber tube communicating with the service-tube. The tube was attached to the service-pipe, and communicated with the house-pipes and branches in the shop. He drew the defendant's attention to the matter, and the latter had the tube immediately removed. Witness then reported what he had seen to Mr. Lynas at the Gas Office.

Robert Davis, inspector of meters for the Old Lodge Road district, gave evidence of the quantity of gas consumed by the defendant between certain specified dates, showing a very considerable disparity in the consumption as indicated by the meter in the house. It was on the 21st of January he visited the defendant's house, and the india-rubber tube had then been removed. The pipes were in proper order when he inspected them. He reported the indications of the meter within the dates mentioned at the Gas Office, and the prosecution was afterwards instituted.

Mr. WARD addressed the Court for the defence, pleading extenuating circumstances.

Mr. O'DONNELL referred to the Act of Parliament bearing on the prosecution, and said the defendant, in fraudulently diverting the gas from the meter, incurred a penalty of £5 and costs, to be forfeited to the Town Council. He could see no circumstance in the case that would warrant the Court in reducing the maximum penalty.



Mr. ORME was of the same opinion.  
A fine of £5, with the costs of the prosecution, was then imposed, and ordered to be handed over to the Gas Committee of the Town Council.  
Mr. WARD subsequently appealed to the Bench to reconsider their former ruling, and mitigate the penalty. He urged several circumstances in extenuation of the offence, and relied on the fact that the Town Council allowed a week to elapse from the time the matter was detected until proceedings were taken, as showing that they were in doubt as to whether the case was one that should be brought before the Court.  
Mr. O'DONNELL said he should like to know what the solicitor acting for the Town Council had to say to Mr. Ward's application.  
Mr. M'LEAN said without the authority of the Town Council he had no power to consent to a reduction of the penalty. He thought the question of reduction was entirely in the hands of the Court, and if the Bench thought fit to take the mitigatory circumstances into consideration he could not interfere. He would remind the Bench that this was the first prosecution for diverting gas from a meter that had been brought by the Town Council, and the offence was a serious one.  
Mr. O'DONNELL remembered a prosecution of a similar nature having been brought by the Gas Company before the works came into the hands of the Town Council.  
Mr. M'LEAN thought the Bench should allow the ruling to stand, and it would be open for the defendant or his solicitor to appear before the Gas Committee and apply to have the penalty, or a part of it, refunded.  
Mr. WARD could not, under any circumstances, agree to such a suggestion. He was not, after pleading a case in a Court of Justice, going to appear before the Town Council to ask that the ruling of the Bench should be altered or rescinded.  
The MAGISTRATES, after deliberation, consented to reduce the fine to £2, with costs.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS.—At the meeting of the Board on Friday last, it was reported by the Special Purposes Committee that the Gas Examiner at the Ladbroke Grove Station of The Gaslight and Coke Company (Mr. J. P. Fewtrell) had resigned his appointment. On the recommendation of the Committee, it was resolved that Mr. J. V. Taylor, the present Gas Examiner at the Hill Street Station of the South Metropolitan Gas Company, be appointed Gas Examiner at the Chelsea Station of The Gaslight and Coke Company for a period of six months from the 22nd inst., at a salary of £150 a year for the two stations. The Committee recommended that a letter be addressed to the President of the Board of Trade, requesting that in any proposed amendment of the penalty clauses of the Gas Acts, provision should be inserted for making any penalties inflicted on a Gas Company for failure to comply with the requirements of their Acts payable to the Board instead of to the Police-fund. They further recommended that a letter be addressed to the Board of Trade, stating that in the opinion of the Board it is desirable that the Sales of Gas Act, 1859, should be amended in order to provide for the examining and certifying of the registering apparatus contained in gas-meters, as suggested in the report of Mr. Keates, submitted with the report of the Committee. These recommendations were adopted.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health, on the Composition and Quality of the Metropolitan Waters in January, 1878 :—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen Nitro- required gen- by		Ammonia.		Hardness (Clarke's Scale).	
		Organic Matter, &c.	As Ni- trates, &c.	Sal- line.	Or- ganic.	Before Boil- ing.	After Boil- ing.
<i>Thames Water Companies.</i>							
Grand Junction . . . . .	20.40	Grs. 0.114	Grs. 0.090	Grs. 0.000	Grs. 0.009	Degs. 13.2	Degs. 3.7
West Middlesex . . . . .	21.20	0.142	0.126	0.000	0.008	14.8	3.7
Southwark and Vauxhall . . . . .	21.40	0.060	0.126	0.002	0.009	13.7	3.7
Chelsea . . . . .	21.40	0.053	0.150	0.002	0.009	14.8	3.7
Lambeth . . . . .	21.40	0.073	0.150	0.002	0.007	14.3	3.7
<i>Other Companies.</i>							
Kent . . . . .	27.40	0.009	0.345	0.001	0.004	18.8	5.5
New River . . . . .	21.90	0.025	0.135	0.001	0.008	15.4	2.8
East London . . . . .	20.90	0.047	0.060	0.000	0.006	12.6	4.2

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, Southwark and Vauxhall and Lambeth.  
C. MEYMOTT TIDY, M.B.

MARYLEBONE VESTRY.—At the Meeting on Thursday last, the Vestry resumed the debate upon the following motion of Mr. Todd :—"That the Parliamentary Committee be instructed to draw up a petition against the proposed Metropolitan Water Supply Bill, with power to print the same and forward copies to each Member of the House of Commons; also to watch the progress of the Bill in the House, and to call on the Churchwardens to convene a public meeting of the ratepayers, if considered necessary, in opposition to the Bill." Admiral Oliver said a more stupid Bill was never submitted to the House. The idea of having a double supply of water to each house was almost too absurd to contemplate. He was quite satisfied with the present supply, which was as pure as possible. Mr. G. Edwards maintained that, as a rule, the public were not satisfied with the present water supply. Mr. Patchett, Q.C., urged the Vestry to take energetic action against the Bill, which, in his opinion, would not only inflict very heavy taxation upon the ratepayers, but would seriously interfere with their rights and privileges. Mr. Galsworthy moved an amendment to refer the matter to the Parliamentary Committee; this was, however, negatived, and the motion was adopted by a large majority.

LAMBETH VESTRY.—At the meeting on Thursday last, a motion was made by Mr. H. White to the following effect :—"That this Vestry, while endorsing the recommendations of the various Commissions appointed by Parliament, to the effect that the supply of water to the Metropolis should be vested in the hands of a Central Authority, and regulated without reference to the profit to be derived therefrom, disagree with the proposals intended to be presented to Parliament by the Metropolitan Board of Works, whereby, in addition to the purchase of the interests of the existing Water Companies to be computed upon a valuation, it is proposed to spend many millions of money to lay down a new and second supply to the Metropolis, entailing a great increase to the metropolitan rating, and causing disturbance of all kinds to the roads and footways throughout the metropolitan area; that

the Parliamentary Committee have instructions to draw up a petition to the Houses of Parliament embodying these views, and that the borough and county Members be requested to support the prayer thereof; that a copy of the above resolutions be transmitted to the Metropolitan Board of Works, and all Vestries and District Boards in the Metropolis." The consideration of the motion was adjourned.

ST. GEORGE THE MARTYR VESTRY.—At the meeting on Tuesday last, the Members resolved themselves into Committee, when the following resolution was adopted, and a copy thereof directed to be sent to the Metropolitan Board :—"That in the opinion of this Vestry it is not desirable that the Board of Works should have control of the water supply, but that it would be better for the Government to deal with the matter generally."

The Bromley Local Board, at their meeting on the 1st inst., resolved to present a petition to Parliament against the Metropolis Water Supply Bill.

YORK UNITED GAS COMPANY'S BILL.

DEFEAT OF THE CORPORATION OPPOSITION.

On Tuesday, Jan. 29, a Special Meeting of the York City Council was held at the Guildhall—the LORD MAYOR presiding—"For the purpose of authorizing the common seal to be affixed to a petition to Parliament, in reference to the York United Gaslight Company's Bill, 1878, and to instruct the Town Clerk to lodge the same in the Private Bill Office, as required by the Standing Orders of Parliament."

The TOWN CLERK read the following petition to Parliament against the Bill, which had been prepared by him at the instance of the Special Committee appointed at the last meeting of the Council, and was recommended by them for adoption :—

That a Bill has been introduced in this present session of Parliament, intitled "A Bill for extending the district within which the York United Gaslight Company may supply gas, for empowering them to construct additional works and to raise additional capital, and for other purposes."

That the said Company was formed by the union of two previously existing companies, under the provisions of an Act of Parliament passed in the year 1844, and that by the said Act the capital of the said Company was declared to be £75,000, with borrowing powers not exceeding £25,000.

That the limits of supply in and by the said Act are the said city of York and certain villages and places in the said Act mentioned, all of which are comprised within a radius of about two miles from the centre of the said city.

That the whole of the said original capital of £75,000 has been raised, and the said sum of £25,000 authorized to be borrowed has been converted into stock of the Company, pursuant to a power for that purpose contained in the said Act, making the present capital of the Company £100,000.

That by the said Act the Company are further authorized to set aside out of the profits of the undertaking a contingent or reserve fund not exceeding £5000, and thereout (amongst other things) to make good any deficiency which may at any time happen in the divisible profits of the Company.

That it is provided by the said Act that the dividends of the Company shall not exceed £10 per cent. per annum, and that when the profits shall exceed that sum, after providing for such contingent-fund as aforesaid, the Company shall make such a rateable reduction in the rates and prices of gas as is therein provided for.

That by means of the profits from time to time made, and by resorting to such reserve-fund as aforesaid for the purpose of making good deficiencies, the Shareholders of the said Company have actually received the full dividend of 10 per cent. ever since the passing of the said Act.

That by the Bill so introduced as aforesaid the said Company seek to raise an additional capital of £100,000, and to borrow in respect of such new capital the additional sum of £25,000.

That by the said Bill the said Company further seek to enlarge the limits of supply to certain other villages and places extending to a maximum distance of about six miles from the centre of the said city.

That by the said Bill it is also sought to acquire additional lands within the said city, for the purpose of carrying on not only the manufacture and supply of gas, but also for the manufacture or conversion of residual products arising from the process of gas manufacture.

That by the said Bill it is proposed to be enacted that the Company shall not in any half year make out of their profits any dividend on the new capital exceeding the rate of £7 per annum, in respect of every £100 actually paid up of such capital as may be issued as ordinary capital, or £6 per annum in respect of every £100 actually paid up of such capital as may be issued as preference capital.

That power is also sought by the said Bill to convert the borrowed money into capital, the dividends on the shares or stock created by means of such conversion not to exceed £5 per cent. per annum.

That by the said Bill it is provided that the prices to be charged for gas by the Company shall not exceed 3s. 9d. per 1000 cubic feet within a radius of two miles from the centre of Ouse Bridge, in the said city, and 4s. 3s. per 1000 cubic feet beyond that radius.

That it is further provided that from midnight to sunset the pressure of supply shall be 6-10ths of an inch, and from sunset to midnight 8-10ths of an inch, and further that the illuminating power shall be 14 candles.

That your petitioners object to the said Bill on the following grounds (that is to say):—

1. That the additional capital thereby proposed to be raised is greatly in excess of what is required for the legitimate purposes of the Company, and the reasonable extension of its works.

2. That for such purposes it is further unnecessary and also inexpedient that the Company should possess the borrowing powers thereby sought, and more especially that the Company should have power to convert such borrowed money into capital.

3. That the enlarged area of supply, extending, as before stated, to a distance of not less than six miles from the city, is not justified by the actual or prospective requirements of the villages, or the numbers and character of the population thereof, and that the cost and comparatively unremunerative character of the works required for such extended supply will greatly diminish, if not wholly destroy, the probability of any reduction from the maximum price of gas to the citizens of York, in whose midst the works are placed, and who have to endure the annoyances incident to their being carried on.

4. That the difference of price proposed to be charged to the citizens, as compared with that to be charged beyond the two miles radius, is inadequate and insufficient.

5. That the dividends of 6 and 7 per cent. respectively, proposed to be paid on the new capital, are excessive, and ought to be reduced.

6. That the dividend of 5 per cent. proposed to be paid on the conversion of borrowed money into capital is excessive, and ought (if such conversion be allowed) to be reduced.

7. That the pressure and illuminating power proposed by the said Bill are respectively inadequate and insufficient, and ought to be increased.

8. That the said Bill contains no provision for the prospective reduction of the dividend of 10 per cent. on the original capital of the company, and that such provision is, as your petitioners humbly submit, expedient and necessary, and ought to be introduced.

9. That the said Bill should, as your petitioners likewise humbly submit, contain powers enabling the Company to sell to your petitioners, and enabling your petitioners, if they should think fit, at any time hereafter, on reasonable notice, to purchase the undertaking of the Company, on terms to be agreed upon, and, if so agreed upon during the progress of the said Bill, to be embodied therein if Parliament should approve thereof, thereby avoiding the expense of future legislation thereon.

10. That the proposed extension of the works of the Company on the sites described in the schedule to the said Bill, such sites being in a populous neighbourhood, and closely adjacent to several valuable villa and other private residences, should be strictly limited to the actual and necessary requirements of the case; and that, having regard to the health and comfort of the inhabitants, it is inexpedient that the conversion of residual products, and the operations incident thereto, should be carried on upon such sites.

Your petitioners therefore humbly pray that they may be heard against the said Bill.

The TOWN CLERK said the object of the petition was to give the Corporation *locus standi*, and it was necessary that it should be presented before the 8th of February. The Committee recommended that it should be adopted at this meeting, it being understood that the discussion upon it, or on any points which the Council might ultimately find it necessary to insist on before Parliament, should be reserved until a future day.

Alderman MARCH moved the adoption of the petition, that the common



seal of the Council be affixed thereto, and that the Town Clerk be instructed to lodge it in the Private Bill Office. He explained that the petition was to place the Corporation in such a position as would give them an opportunity of opposing any clause in the Bill which might appear objectionable to the Council and to the city.

Mr. MANN seconded the motion.

Mr. J. BROWN complained that the petition went into matters of objection to the Bill, and was not, as the Town Clerk designated it, a mere formal petition for the sake of obtaining *locus standi*.

The TOWN CLERK said every petition against a Bill of this kind must state the grounds of objection relied upon. He distinctly stated this to the Committee, and read the Standing Order of Parliament requiring it. He was instructed to prepare a petition accordingly, which it was agreed should be laid before this meeting; but the discussion upon it was to be postponed, the object being to preserve the *locus standi* of the Council.

Mr. BROWN said it was understood at the Committee that the matter was to be received *pro forma*, and was to be merely of a formal character. Besides that, nothing had been agreed to by the Committee. This petition had never been before them, and he thought some further instructions must have been given.

The TOWN CLERK denied that such was the case. He had received no instructions other than those with which Mr. BROWN was familiar.

Mr. BROWN said the Committee did nothing except appoint a Sub-Committee. Certain statements were made, and laid before that Sub-Committee; but the Committee themselves did not pass a formal vote with regard to those matters that were put upon the paper, and which formed, to a very great extent, the subject matter of the petition. To his mind it appeared somewhat singular that the Committee, on being appointed and called together, should not have come to a decisive opinion with regard to the matters placed before them, and it also appeared to him that the Sub-Committee had a kind of roving commission, and were allowed to do what they pleased, and, having come to a decision, that they should submit it to the General Committee. This did not appear to him to be a proper way of conducting business. He thought the Council ought to know, in the first instance, their objections to a question of that nature, and it seemed to him trivial to go to Parliament with a petition that had not been agreed to by the Committee, stating that the Council objected to certain things which the Council had really never objected to. It was only right and fair to the Gas Company, who had carried on their business in a respectable manner, that the Council should treat them in a proper and respectful manner. There were certain things stated in the petition to which he did not agree, and to which he did not think the Council, as a body, would agree. It was all very well to say that they could please themselves afterwards, and go on with any part of the petition, or withdraw any part of it; but when once they got a thing placed on paper by way of giving a sort of *quasi* consent to it, it was a difficult thing to strike those things out of the petition. He did not charge anybody with anything, but still he did not agree with the petition.

Mr. E. T. WILKINSON said he agreed with what Mr. BROWN had stated. The Council were called together and asked to object to a Bill, promoted by the Gas Company, on grounds which had never been discussed by any Committee. They had appointed a Committee to consider the Bill, but they had never done so, and had not arrived at any conclusions with respect to it, and yet the Council were asked to object to that Bill, on certain grounds upon which they had no information whatever. He thought it was altogether premature, and was placing the Council in a false position. He could not agree to the petition objecting to the Bill unless he knew what he was doing. They objected to the proposal of the Gas Company to deal with the residual products; but the proper course would have been to ascertain what was the process of manufacture which the Gas Company proposed, and then consider it.

The TOWN CLERK said a letter was written by him about a week ago to the Gas Company's Solicitor making that inquiry, and the only answer he had received was that he would take the earliest opportunity of laying it before his Directors.

Mr. WILKINSON: That letter has never been laid before the Committee.

The TOWN CLERK: I read it the other day.

Mr. WILKINSON said the Committee did not regard it as a refusal to furnish information. The Council were asked to object to a Bill on grounds which might be just or unjust—at present he thought they were most untenable and unjust—and he flatly refused to concur in the petition. He hoped every Member of the Council who believed that it was unfair to the Gas Company that they should object to the proposed increase of capital without having information for what it was required—and they had not obtained that information—would refuse to support the motion. Unless Members of the Council believed that they ought to compel the Gas Company, at some future date, to sell their works to the Corporation, they ought not to vote for the petition.

Sheriff BELLEBY thought that the meeting was quite unprepared for any discussion on the matter. By the unanimous vote of the Committee a petition was to be presented by the Town Clerk, and it was then understood that discussion might hereafter take place on any point it contained. There might not necessarily be any objection ultimately; but the statements in the petition were simply introduced in order that the Corporation might not be "out of court" when the time came. As the Town Clerk had stated, it was necessary to take wide grounds, so that when the matter came up for discussion by the Council they might then, as they had the opportunity, decide whether to proceed with any portion of the petition, or the whole of it, or withdraw it. The action of the Committee so far had been to protect the interests of the city, as it was felt to be a very important matter when the Gas Company proposed to more than double their capital. The Committee had asked for some information as to the purpose for which that large extension of capital was required, and they had not received it. It was not fair to charge the Committee with not having sought information; they sought for it, but did not get it. If they had not adopted the present course, and if the petition was not presented before the 8th of February, they would be "out of court," and would have no chance whatever to do anything to protect the interests of the city. The course now being taken by the opposition was most unfair and disloyal to the Committee.

The TOWN CLERK, in reply to Mr. DICKENSON, said that it would be necessary to bring the matter again before the Council, in the manner prescribed by the Borough Funds Act, and to give ten days notice of it. It was at that more formal meeting that the discussion should take place.

Mr. DAVISON opposed the motion, because the petition alleged objections to the Company's Bill, which had never even been mentioned before the Committee. He thought he might fairly say that if the petition had been read before the Committee in its entirety, several Members would not merely have abstained from voting, but would have opposed it entirely. There were many clauses introduced in the petition, which he thought many Members would not consider any objection to the Bill; for instance, the charge of 6d. per 1000 more for the gas supplied to the country districts than to the town, and the rate of interest which it was desirable to charge upon the increased capital. There were also other points, and he thought that before the petition was submitted to the Council it ought in its entirety to have been read before the Committee, and so altered

that it might come before the Council with the concurrence of the entire Committee.

Mr. DICKENSON said he was sorry the Council had placed themselves in what seemed to him to be an undignified position, for it was strange that they should promote a petition if they did not in some sense endorse the terms of it.

The TOWN CLERK repeated that it was distinctly understood in the Committee that the petition should be laid before the Council *pro forma*, and that the discussion should be adjourned to a future day, in order that they should not lose the opportunity, by delay, of being able to present the petition. There was no intention on the part of the Committee to suppress discussion, but that the discussion should take place at a meeting, of which proper notice should be given under the Borough Funds Act.

Mr. CRUMMACK said he believed that a great deal of that objection would have been obviated if the reply from the Gas Company had not been so curt as it was. If the Company had given the Committee that information, there was no doubt that they would have altered the terms of the petition. The petition, as it was now submitted, was simply a protective petition, and if the Gas Company had given them the information they asked for, that petition would in all probability have been withdrawn.

Alderman WEATHERBY desired to offer some remarks, but Sheriff BELLEBY objected, on the ground that the worthy Alderman was Chairman of the Gas Company. He protested against any Shareholder taking part in the discussion.

Mr. BROWN rose to order, and said he thought the Chairman of the Gas Company was entitled to answer a question.

Mr. MANN said there were several members of the Council whose interests were involved in this question, and if the consumers of the city could not obtain protection from the Council he thought they ought to promote an Association for the protection of themselves.

Mr. WILKINSON appealed to the Town Clerk as to what was the law with respect to Shareholders taking part in the discussion. His impression was that they could not vote, but that they were allowed to take part in the discussion.

The TOWN CLERK said that in his opinion no Shareholder of a company could take part in any discussion or vote in the Council in respect to any matter in which he was a Shareholder.

Alderman MELROSE said he did not expect the Council would endorse all the objections that were alleged in the petition, nor would he do so himself; but at the same time it made all the difference between having a petition and none. If it was to be presented simply in order that some agreement might be come to with the Gas Company, he thought it was well they should be placed in that position.

Mr. SCOTT thought that possibly the petition might be modified.

The TOWN CLERK said they could abandon any or all of the allegations hereafter if they chose, and the Council were not in any way committed to any approval by adopting them now *pro forma*. He explained that he was instructed by the Committee to draw up a petition. He was obliged, therefore, to use such knowledge and information as he possessed, and to state such grounds of objection as he thought might be taken by the Council. The 128th Standing Order provided that "No petition against a Private Bill shall be taken into consideration by the Committee on such Bill, which shall not distinctly specify the ground on which the petitioners object to any of the provisions thereof, and the petitioners should be only heard on such grounds so stated." It was, therefore, he continued, necessary for him to go into details upon all the points which he thought were necessary to be brought before the Committee and the Council for consideration. He had embodied those grounds, as he was bound to do, in that petition, and it was for the Council to say how many they would think it their duty to urge or abandon; or they might abandon the petition altogether if they made such arrangements with the Gas Company as were satisfactory; but, if they were to have *locus standi* at all, they must lodge the petition in due time.

The motion was then put that the petition be adopted, and, on a division, was negatived, the numbers being—

For . . . . . 11

Against . . . . . 13

The LORD MAYOR declared the motion lost.

#### CAMBRIDGE UNIVERSITY AND TOWN GAS COMPANY.

The Ordinary Half-Yearly Meeting was held on Thursday last—the Rev. Dr. PHELPS, Master of Sydney Sussex College, in the chair—when reports by the Directors and the Manager were submitted.

The Directors, in their report, recommended that a dividend for the half year after the rate of 10 per cent. per annum on the consolidated stock, and after the rate of 7 per cent. per annum on the amount paid up on the new shares, as well as 2 per cent. on the consolidated stock, on account of the deficiency in the dividend paid for the half years ending Midsummer and Christmas, 1873, be paid on the 1st of February inst, free of income-tax. The plans and specifications for the new works, referred to in the last report, had been placed in the hands of seven builders, in answer to public advertisements, and tenders had been received, which were now under consideration.

The MANAGER (Mr. James Weeks) reported that a steady increase in the demand for gas had been maintained. The works had been kept in an efficient state, and the illuminating power, pressure, and purity of the gas had been fully up to the required standard.

The CHAIRMAN proposed that the reports be received and entered on the minutes. The fact that there was little to say was a good omen for the Company, and he congratulated the Shareholders on the condition of the concern altogether. He thought they had before them a period of great prosperity, provided there were no enormous rise in the price of coals. The consumption of gas was steadily increasing, and that impressed the Directors with the great importance of extending the works. Accordingly, they had plans before them for some very important additions; tenders had been received, and the work should be proceeded with immediately. That, of course, would require a call on capital. When speaking of the increase in the consumption of gas, he looked forward to a source of that increase which was being recognized all over the country—namely, the consumption of gas in cookery. They might depend upon it that this consumption would go on steadily increasing, and would call for gas during the summer months. This would be an enormous advantage to Gas Companies, for one difficulty they had to contend with was the unequal employment of labour. With the summer demand increased, the employment of labour could be equalized, and this would affect the price of gas. Supposing things to turn out as he opined, he hoped the Shareholders would look forward to the Directors treating the *employees* of the Company with great liberality. They had in Mr. Weeks and Mr. Gifford men whose services could not be too highly appreciated. He did not say they were going to call upon the Company for any great advance in their remuneration at present; but if the position of the Company justified it, they could not, in reason, over-estimate the services of such men.

Mr. ALLEN seconded the motion.

Mr. BOND supported the motion, and hoped that if there should be no rise in the price of coal there might be a reduction in the price of gas.

The CHAIRMAN said the Directors did not lose sight of this; and, in



answer to questions, said that the law charges were an accumulation, and had reference to legal matters which the Directors could not avoid. The interest paid on loans was 4 per cent.

The reports were adopted, and a dividend declared in accordance therewith.

Dr. DROSER proposed a vote of thanks to the Chairman, and hoped the prosperity of the Company would continue.

Alderman PÆD seconded the motion, and spoke of the indebtedness of the Shareholders to the Chairman and Directors for the excellent way they managed the concern.

The CHAIRMAN, in responding, said very much of the Company's success was due to his colleagues, who were the working men of the Company, and paid the most assiduous attention to the affairs. He could not praise them too much. They did their work efficiently and carefully, and their services deserved recognition.

#### CAMBRIDGE UNIVERSITY AND TOWN WATER-WORKS COMPANY.

The Ordinary Half-Yearly Meeting was held on Thursday last—the Rev. Dr. OKES, Provost of King's College, in the chair—when reports by the Directors and Engineer were presented.

The Directors, in their report, recommended that a dividend on the consolidated stock and upon the first call on the new shares for the half year ending Jan. 6, 1878, at the rate of 10 per cent. per annum be paid on the 1st day of March next, free of income-tax. After paying this dividend there would be a balance of £37 18s. 5d. to be carried forward. The Directors were of opinion that the present low price of iron afforded a favourable opportunity for the completion of the duplicate main to the works at Cherryhinton. To meet the cost of this, and to provide for the payment of the balances which will shortly become due to the Contractors for the new engine and buildings, a call of 10s. per share will be made upon the new shares, payable on the 6th day of April next. The retiring Directors were the Rev. Dr. Robinson and Mr. Elliot Smith, who were eligible for re-election.

The Engineer and Manager (Mr. Henry Tomlison) in his report stated that during the past half year water from the Company's works had been laid on to 92 premises, the increased rental derivable from which was £301 per annum. The total number of premises now supplied is 6911. The new engine erected at the Company's pumping-station had been at work during the last month, and would shortly be handed over to the Company by the Contractor. The extensions of the Company's mains during the last half year included one for the supply of water to a portion of the village of Old Chesterton. The general condition of the Company's works was satisfactory.

The CHAIRMAN moved the adoption of the reports, and congratulated the Company on their continued prosperity, more especially as it had enabled them to complete the scheme of distribution designed by their original Engineer. So great was the demand for water, that it was necessary to take measures to keep a supply that was unfailing at any time. As to the accounts, which he hoped were well looked into by the Shareholders, it was a matter for congratulation that the receipts for water-rates were on the steady increase. The water account, was not so good it was true, owing to the Railway Company ceasing to take water of them, to the smaller quantity of water used in street-watering (in consequence of the nature of the seasons), and to the diminution in the demand for coprolite washing. On the other hand, the fittings account was large, and counter-balanced the other. It was desirable, for the sake of both the Company and Consumers, that the fitting work should be properly done, and there was every reason to believe it was well done.

Alderman DEATH, in seconding the motion, said the works were in a very satisfactory state, and he was sure that so long as they received 10 per cent. dividends there would be no complaint.

The reports were adopted, and a dividend agreed to according to the recommendation of the Directors.

The Rev. Dr. ROBINSON and Mr. ELLIOT SMITH were re-appointed Directors; and each gentleman thanked the Shareholders for their continued confidence, and promised to do what he could for the future success of the concern.

Alderman DEATH proposed a vote of thanks to the Chairman, and trusted that Dr. Okes might long occupy the position in the Company which he now did with so much advantage.

Mr. EADEN seconded the motion, which was agreed to.

The CHAIRMAN said he was very much obliged to them, and especially for their consideration of his infirmities of body—not yet of mind, he hoped. He should try to merit their approbation.

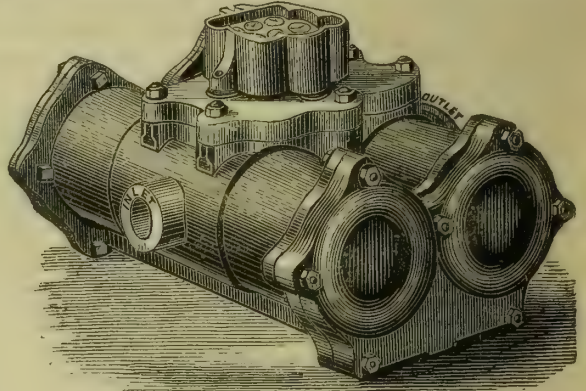
**LOCAL GOVERNMENT BOARD INQUIRIES.**—Mr. R. Morgan, one of the Inspectors of the Board, held an inquiry at Dawlish last Wednesday, on an application of the Local Board to borrow £10,000 for water-works extensions, &c. He also held an inquiry at Torquay on Thursday, on the application of the Local Board of that town to borrow £21,000 for the purpose of extending the water-works. At Pemberton, on Tuesday last, Col. Cox held an inquiry with reference to an application by the Local Board for powers to alter the Pemberton Local Board Water Act, 1875, so as to increase the borrowing powers of the Board, for the carrying out of the Act, from £34,000 (the sum therein stated) to £105,000.

**LECTURE ON COAL GAS.**—On Tuesday evening, Jan. 22, Mr. Samuel Hunter, C.E., the Salford Borough Gas Engineer, repeated his lecture on the "History, Manufacture, and Economical Use of Coal Gas," at the Pendleton Town Hall. The chair was occupied by Alderman M'Kerrow, who, in introducing the Lecturer, said the lecture to be delivered by Mr. Hunter was the same as that given by him at the Salford Town Hall some little time ago. The Members of the Borough Council, who were present at that lecture, were so impressed with its instructive character, that they induced Mr. Hunter to consent to repeat it in Broughton and Pendleton. The Pendleton Committee, therefore, offered Mr. Hunter the use of the Pendleton Town Hall, and under those circumstances they were met that night. The subject they were led to consider must be of great interest to every one, because they might say that gas had become one of the necessities of life; and the Lecturer was one who was thoroughly conversant with his subject. Mr. Hunter was not only an able theorist, but a practical demonstrator on the subject of gas. During the time that the Salford Gas-Works had been under his management, they had been much more successful than at any previous time. Although they knew that gas was so well and economically made in Salford, still in these days, when science was making such vigorous and rapid strides, he thought he would be a bold man who would assert that Salford gas was the very best illuminating power, because he considered that some persons might see the day when our streets would be lighted by electricity. But should that time arrive in Mr. Hunter's life, he believed he was quite capable of managing the system; and he had no doubt he would find means of adapting the present works to that system. Mr. Hunter then proceeded with his lecture, which was listened to throughout with great interest. There was a large attendance, and at the close of the lecture a vote of thanks was accorded to Mr. Hunter.—*Salford Weekly News*.

#### THE UNION WATER-METER COMPANY, LIMITED.

A Company has just been formed and incorporated, under the above title, for the purchase of the patent rights, in the United Kingdom, of the American Water-Meter Company in the invention of Messrs. Ball and Fitts, of Worcester, Mass., U.S.A., of "Improvements in the Construction of Water-meters."

The value of an efficient water-meter can scarcely be overrated. The attention which has recently been attracted to the subject of the waste of water in every town in the kingdom, and the growing desire so frequently expressed for a change in the basis on which the charges of Water Companies rest, have increased the general interest in this subject. Much ingenuity has been expended in efforts to produce perfect water-meters, and the patent registers show that inventors have been very sanguine in their hopes of having achieved success in this direction. Few, however, have proved wholly satisfactory under all the varying circumstances to which instruments of this kind are exposed.



The Union Water Meter, of which an external view is here given, is of the positive class—i.e., a meter in which a measuring chamber is alternately filled and emptied, each filling being duly recorded. It is formed of two cylinders, with double pistons in each, having a rotary valve of peculiar construction which is worked from cams on the piston-rods. This rotary valve is provided with suitable ports or openings, through which the liquid to be measured can be supplied to the meter, and be discharged therefrom, the registering mechanism deriving motion from the bevel pinion which operates the gear of the valve.

It is claimed for this meter, among its advantages over other piston meters in use, that it is extremely small and compact, and that its durability and accuracy have been proved by the fact that upwards of 20,000 of them, of various sizes, are in successful operation in the States. In England the instrument has been fully tested by several Water Engineers of eminence, and pronounced by them as a reliable and satisfactory register of water supply; it is also economical in cost.

The English Company, of which Mr. W. C. Parkinson, of Cottage Lane, City Road, is the Chairman, have made arrangements with the well-known engineering firm of Messrs. Merryweather and Sons for the manufacture of their meters, a fact which is in itself a guarantee for the character of the workmanship employed in their construction.

#### IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There has been no particular change in the local iron trade during the week, but from what I hear I shall not be at all surprised at another attempt being made to get down wages in the mills and forges almost immediately, in consequence of the reduction which has just been declared in South Staffordshire. Some of the local employers are already talking of enforcing this drop here, and say that they really must be placed on equal terms with the other ironmaking districts, if they wish to retain any chance in the current competition of the day. It will be remembered that, by the reduction which was effected at Christmas, puddlers wages were lowered to 8s. per ton, and the millmen, rollers, and hammermen were similarly dealt with on a per centage. The pig iron market here is fairly steady, but quiet at the recently quoted rates, and whilst the state of foreign politics remains as unsettled as at present there is not much chance of higher figures being attained.

At several of the local blast furnaces experiments are in progress for the purpose of devising a more economical working, and the better utilization of waste heat and gases, for it is felt that every possible advantage of that kind will be needed by iron, in the competition to which it is being subjected by Bessemer and other steel.

In finished iron there is nothing of any importance being done, but in several descriptions of manufactured iron a fair trade is being transacted. Fuel is very abundant, as has been frequently remarked of late, and there is as yet no sign of any change of prices, in either direction. The present severe weather, however, is causing a better call for household qualities of coal.

#### THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Trade throughout this district continues in a very unsettled condition, and consumers are still very cautious in buying anything beyond their immediate requirements, notwithstanding the exceptionally favourable prices now ruling in the market. Both in coal and iron the production in this district is much in excess of the demand. Although this should be about the busiest time in the year, very few of the collieries are able to dispose of anything like the whole of the coal they could raise, and where they are running full time, stocks in most cases are going down. With regard to the iron-works, the position of affairs is even worse; more than half of the furnaces have now been out of blast for a considerable time, and the majority of the finished iron-works are with difficulty kept going more than three or four days a week.

In the coal trade, although there is no actual alteration of the list rates, there is a great deal of pushing for orders, and needy holders are willing to sell at extremely low prices. The demand for the better classes of round coal for house-fire purposes is only very moderate for this time of the year, and other classes of fuel are more or less a drug in the market, owing to the general depression in all the chief coal-consuming branches of industry. The average quotations at the pit mouth are about 10s. to 11s. per ton for best Wigan Arley, 8s. to 9s. for common ditto, 8s. to 8s. 6d. for Farnworth four-feet, 6s. 6d. to 7s. 6d. for common Wigan mines, 5s. 6d. to 6s. 6d. for forge and steam coals, 4s. 6d. to 5s. 6d. for burgy, and 2s. 6d. to 4s. per ton for slack, according to quality.



There is still little or nothing doing in the shipping trade, and prices continue extremely low.

Lancashire makers of pig iron still maintain late rates, and for delivery into the Manchester district quote 51s. per ton for No. 3 foundry, and 50s. for No. 4 forge, less 2½ per cent.; but they are completely undersold by outside brands, and are able to secure very few orders, except where they have a considerable advantage in the rate. For finished iron there is only a very limited demand, and prices for delivery into the Manchester district are about £6 7s. 6d. to £6 10s. per ton for North Staffordshire bars, £6 5s. to £6 7s. 6d. for Lancashire, and £6 3s. 6d. to £6 5s. for Middlesbrough bars.

#### THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

Business in the North of England was a great deal more unsettled last week than the week before. The daily change in character of the news from the East, with the war feeling that seems to be prevailing amongst a considerable class in this country, are unsettling everything. The strike in the Northumberland steam-coal district is not over, so that operations for the year are limited, for no one can tell what the next fortnight may bring forth. The only business of any value, indeed, that is being transacted is in best gas coals. Some of the foreign Gas Companies came into the market last week, and entered into contracts for the year. The rate is not beyond 7s. 6d. per ton. Nearly all the business that has been transacted has been upon this basis, and it will continue to be so, no doubt. Best gas coals, for immediate delivery, in some cases fetch 8s. per ton. There have been some more shipments to Boston, U.S.A., of part cargoes at that rate. Second-class gas coals do not get off very freely, and there is a wider range of prices than for best, with no particular desire to enter upon arrangements for the year, except by Gas Companies in the immediate locality. All the better class of collieries in the gas trade are working up to full time. There are some small strikes in the Durham district; but they do not amount to very much. House coals are firmer; but there is no rise in price, nor any probability of it. Of course, so long as the principal steam collieries are closed, the shipments of steam coal from the Tyne need hardly be counted amongst the exports. It is a singular thing, but it is a fact, notwithstanding, that though the Northumberland steam collieries have been closed over the whole of January, the shipments of Durham coals from the Tyne dock in that month were more than in the corresponding month of 1877.

The destitution amongst the pitmen on strike is extending. There were meetings between the owners and the representatives from the men last week; but a difference of some 3 or 4 per cent. prevented an arrangement. It is very probable, however—possibly, indeed, before this communication is in print—that an understanding may be come to, and that the collieries will be got to work again.

Coasting business was duller than ever last week. There was scarcely an order at all in the market for the British Channel, and the French business fell off considerably. Some more charters were entered upon by steamers to take gas coals out to the West of Ireland; but beyond that and some trifling business done in gas coals to the Italian ports, freighting was about nil.

The iron and general manufacturing trades of the North of England are unchanged. They could not very well be worse. Chemicals are about 30 per cent. cheaper than last year at this time, and, generally speaking, there is little disposition to enter upon any sort of business. Mercantile houses have their travellers upon the Continent seeking orders, but foreigners are not at all inclined to enter upon any kind of trade from this country until they can see a little further what position we shall take with regard to the Eastern Question in the spring of the year.

The number of unemployed men increases daily, and some hundreds of seamen in the seaports are in a state bordering upon starvation. Most wages have a tendency to get lower, as there are any number of men ready to take work at a very moderate rate.

#### TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The resolution to adopt the Burghs Gas Supply (Scotland) Act in Burntisland has now legally taken effect, as it has been formally registered in the Sheriff Court books of the county, in accordance with an interlocutor from Sheriff Bell authorizing the same to be done.

On Monday, the 28th ult., a special meeting of the Elgin Town Council was held, at which Lord Provost Culbard moved that steps be taken to get estimates for the erection of new gas-works, and the laying of a new set of gas-mains throughout the city. A long discussion took place on the subject, but it was ultimately resolved to consider in private what measures should be adopted by the Council, as Gas Commissioners, with the view of acquiring the works and plant of the existing Gas Company, together with all their rights and privileges.

Dr. Wallace's report upon the illuminating power of the Glasgow gas for the week ending the 26th of January shows a marked improvement, so far as the minimum is concerned, which in no instance was lower than 26·14 candles. The average illuminating power ranged from 27·11 candles to 27·49 candles, and the maximum from 27·40 candles to 28·83 candles. Accompanying his last report, Dr. Wallace gives some particulars as to the districts within which his four sets of analyses are made every week, so that it can be seen at a glance how the results attained by the various station managers are comparable with each other. From Dawsholm works all the northern portion of the city east of the Kelvin is supplied, and is known as the northern district. The Dalmarock works supply the central and eastern portions of the city, south of a somewhat irregular line extending from the west-end of Sauchiehall Street to Canntyne, and also the town of Rutherglen. The whole of the city and suburbs south of the Clyde are supplied by the Tradeston works, while those at Partick supply the suburbs west of the Kelvin. Of course, there are very careful records kept in the Corporation Gas Office of the economical results attained at the different works; and there is a sort of rivalry or competition amongst the several managers, each of whom is paid a fixed salary, and a bonus varying with the character of his results over a certain period.

In addition to the few facts mentioned in a paragraph in last week's JOURNAL, referring to the Partick, Hillhead, and Maryhill Gas Company, it may be stated that the illuminating power of the gas supplied by the Company is very rarely lower than 29 candles. The length of the mains now laid by the Company amounts to about 74 miles, chiefly over an area which is very much undermined by coal and ironstone workings, and the leakage or unaccounted-for gas is only 15 per cent.

The town of Annan is now on the move for improving its water supply and its sanitary condition. At a meeting of the Police Commissioners, yesterday week, it was resolved, on the motion of the Provost, seconded by Mr. Foster—"That a committee be appointed to find out the cost of bringing water into the town, and improving the drainage." There was a long debate on the subject, and an amendment proposed by an ex-Provost—"That a plebiscite of the ratepayers be taken, as to whether they want a new water supply, before any steps be taken"—was lost.

On Tuesday last, water was introduced into the town of Galashiels from

the Caddon. It is not as yet available for domestic use, but only for the purpose of testing the piping. The pipes are now laid all the way from the intake, about a mile above Windydoors, to the service reservoir near the town, and from thence to the town through all the streets. None of the reservoirs are yet available for use; but the pipes are laid past them, and the water is run direct from the Caddon without filtering or settling; indeed, filtration is not contemplated in the scheme. The design is to fill the large reservoir now forming at Knowes Dean with clear water from the Caddon, when the stream is pure, and then supply the town from that source. When tested last Tuesday, with one trifling fault, the entire length of the piping was found to be quite perfect.

During the fortnight ending the 29th of January, the delivery of water into Edinburgh was at the rate of 6230 gallons per minute, equal to 31·28 gallons per head per day to a population of 286,600; and at that date there was an increase in the amount of water in store, as compared with the amount in store on the 15th of January, of 19,305,379 gallons.

Owing to the excited state of the political atmosphere during the past week, the Glasgow pig iron market has shown some signs of unsettlement, and there has been some fluctuation in prices. The tendency, however, has been upwards. The market was strong on Friday forenoon, when business was done in warrants at 51s. 6d. cash, and 51s. 7½d. one month, closing with buyers at both prices, sellers asking 51s. 6d. prompt, and 51s. 8½d. one month. There was also a firm market in the afternoon, sellers asking 51s. 6d. cash, and buyers offering 51s. 5d. The finished iron trade is in a very unsatisfactory condition. One large establishment in the Coatbridge district has not resumed work since Christmas, and in other instances the wages are being reduced, while the men generally are on short notice.

The past week's business in the coal trade has not brought out any new feature which can lend encouragement to hope of an early improvement. A speedy conclusion of peace in Eastern Europe is ardently longed for. In the shipping department there is but a dull, dragging business; indeed, it is only in the department of house coal that there is the slightest semblance of activity, and even that falls off as soon as there is any appearance of mild weather.

**MAIDSTONE GAS SUPPLY.**—At the meeting of the Maidstone Board of Health on the 23rd ult., the Mayor (Alderman Haynes), referring to some remarks which had been made on the reported excess of sulphur in the gas supplied to the town during the last few months, announced that the Gas Company were about to spend a large amount of money in purifying the gas. Their present means of purification were found to be quite inadequate to the demands arising from the enormous extension of their business, and sometimes the apparatus was quite overcome by the amount of gas passed through. The Directors, therefore, had decided upon the provision of full and sufficient means to enable the gas to be sent out as pure as in the Metropolis, and personally he could see no reason why it should not be as good as any gas in England. Within the next two or three months the public might expect the evil to be remedied, and the new works to be in operation, as the Company were determined on leaving nothing undone to raise the quality of the gas supplied by them.

**SWINDON WATER-WORKS COMPANY, LIMITED.**—The annual report and financial statement of the Directors presented to the meeting of Shareholders yesterday show a considerable improvement in the receipts during the past year, amounting to £466 16s. 7½d., the greater part of which—viz., £424 15s. 3d.—is for water supply. This increase in the receipts has been attended by an additional outlay of only £26 3s. 8d. to the general expenses of the Company. The number of householders applying for the Company's water shows no decrease on former years, there being 373 attachments, against 372 the previous year. The Directors state that they have entered into a contract with Mr. J. H. Porter, C.E., to apply his patent for the purification and filtration (known as the "Porter-Clark process") to the water of the Company, so as to filter and partially soften it. This will be attended with considerable expense, but the Directors feel that, having the supply of this increasing town under their control, it is their duty and their best policy to give the inhabitants the purest water in their power. To carry out the necessary works, the Directors propose to call up the remaining 12s. 6d. on the 5000 shares not fully paid. The whole costs of the Chancery suit have now been defrayed, and the total on that account now due to capital—viz., £2897 1s. 10d.—the Directors propose to continue to pay off at the rate of £250 per annum, as before agreed upon. The Directors recommended a dividend of 7½ per cent., free of income-tax, to be paid out of the net earnings of the Company for the year 1877, which required £1265 12s. 6d., leaving a balance of £728 9s. 5½d., £250 of which is appropriated to repayment of loan from capital for Chancery suit fund account, and the remaining £478 9s. 5½d. added to contingent-fund, which now amounts to £1998 1s. 2d. During the past year the Board lost, by death, the services of Mr. J. Armstrong, and by retirement, Mr. W. Read; these removals they record with regret. The Great Western Railway Company filled up the former vacancy by the appointment of Mr. Holden, and the Board filled up the latter by the appointment of Mr. Moss. On account of the increasing number of accounts which the Secretary has to keep, and the necessary time occupied in balancing and auditing the books, it is intended that the annual meeting in future should be held on the first Monday in March.

**GAS EXPLOSIONS.**—"A Gas Manager," writing to *The Times*, says: "I have been expecting that some one would call the attention of the public, through your columns, to a very simple remedy for one of the most fruitful causes of gas escapes—namely, water-joint pendants, one of which, in all likelihood, was at the bottom of the accident at Southport. This apparatus is ill understood by the bulk of gas consumers, who seem to forget that water will evaporate, and very quickly too, in a heated room, so allowing the gas to escape in such quantity as to cause a serious explosion in a very short time. The evaporation of the water in the pendant and the risk of accident arising therefrom may be prevented by adopting the following simple and effectual remedy:—Fill with water the water cup at the top of the outer tube of the pendant to within an inch or two of the top, fill up the remainder with rape or sweet oil, and the pendant will then be safe and require no attention in this respect for a lifetime. Pendants, if drawn down during the evening, should always be pushed up again before retiring for the night." Another correspondent, "H. F. S.," writes: "As a recent sufferer, may I call attention to a cause of these now frequent disasters? They arise, in many cases, from the use of pewter pipe, known in the trade as 'tripe.' This pipe is very cheap, and, like other cheap goods, of too inferior quality for the work required. It is really a substitute for 'tin' pipe; but this is expensive, and the cheaper article is used and charged for as the higher-priced material. This cheap pipe, on being bent, readily cracks, as it has not the tenacity of good tin pipe, and it can be pierced by a tin tack. It melts at the low temperature of solder, and if there is a fire it opens at once a way for the gas to burn. The gas-fitters, to do their work quickly, join by a soldered joint any required branches, instead of putting in brass connecting-pieces as T's and unions, and cracks frequently occur at these cheaply-made connections. The only safe pipes are those made of iron and real tin tube, and all joints from the tin to the iron, or between the tin tubes, should be made by brass unions. The best houses, if ordered, will put in proper work."



**BOSTON WATER-WORKS COMPANY.**—The dividend declared for the past year is at the rate of 9 per cent.

**WORCESTER GAS COMPANY.**—At the half-yearly meeting, on the 29th ult., the usual dividend of 10 per cent. per annum was declared upon the old capital, and also a dividend upon the new £2 shares.

**FIRES IN LONDON.**—Captain Shaw, in his report, of Thursday last, on the fires occurring in the Metropolis, states that three out of eight fires which happened in the previous 24 hours were caused by lights being thrown down, and by seeking for an escape of gas with a light.

**GAS EXPLOSION AT SEDGLEY.**—Owing to the fracture of a main belonging to the Dudley Gas Company, an escape of gas took place into a street sewer, and on Tuesday last an explosion occurred, doing some damage to an adjoining house, as well as destroying a portion of the brickwork of the drain.

**ILKESTON WATER SUPPLY.**—The Local Board have given notice that they intend to apply for power, under the Public Health Act, 1875, to construct a reservoir at Shipley, in connection with the proposed water-works, to hold 182,000 gallons of water; also a storage reservoir at Little Hallam capable of holding about 7,000,000 gallons.

**BROADSTAIRS WATER COMPANY.**—At the meeting of this Company, on the 29th ult., the Directors were enabled to recommend a dividend of 2½ per cent. for the half year, making with the interim dividend in July 5 per cent. for the year. It was also resolved to raise £1000 additional capital by the issue of preference stock, bearing interest at the rate of 5 per cent., to be issued to the ordinary stockholders *pro rata*.

**REDUCTIONS IN THE PRICE OF GAS.**—The Directors of the Northampton Gas Company have reduced the price from 3s. 6d. to 3s. 4d., to take effect from Christmas last. The Handsworth Woodhouse Gas Company will reduce their price from 5s. to 4s. 7d. on the 2nd of April next. The Oaken-gates Gas Company and the Hadley and Trench Company have both reduced the price of gas 3d. per 1000 feet.

**SCARBOROUGH WATER-WORKS.**—It is reported in a local paper that an agreement has been entered into between a deputation of the Corporation and the Directors of the Water Company, subject to the approval of the Town Council and the Shareholders, for the sale of the local water-works, at 25 years purchase of the maximum dividends allowed the Company by their Acts of Parliament.

**IMPERIAL CONTINENTAL GAS ASSOCIATION.**—At an extraordinary meeting of the Proprietors, held at the City Terminus Hotel on the 31st ult., it was unanimously resolved—“That this meeting approves of the Imperial Continental Gas Association Bill now before Parliament, subject to any alterations which, with the concurrence of the Directors, may be made in the Bill in its progress through Parliament.”

**QUALITY OF THE BIRMINGHAM GAS.**—Mr. T. Jackson reports that during the month of January, at the four gas-making stations of the Corporation, he made 20 examinations of the illuminating power of the gas supplied to the borough. The maximum light in sperm candles was 18·31; minimum, 16·85; average, 17·40. The parliamentary standard is 15 candles with Sugg's No. 1 “London” burner.

**PETHWORTH GAS COMPANY.**—The report of this Company, which has just been issued to the Shareholders, is of a satisfactory character. A new scrubber and steam-pump have been added to the plant, greatly improving the quality of the gas. These forming a permanent addition to the Company's plant, the Directors have thought it right to defray the cost from the reserve-fund. They recommend a dividend at the rate of 7½ per cent. per annum, which will leave a balance in hand of £57 3s. 10d.

**WEARDALE AND SHILDON WATER COMPANY.**—The accounts attached to the Directors report show that the revenue for the past six months, including the balance brought forward, gives a disposable balance of £5711 16s. 3d., out of which the Directors recommend a dividend (clear of income-tax) of 10s. 6d. per share on the shares (Act, 1866); 5s. 5·6d. per share on the first issue of shares (Act, 1875), £15 paid; and 3s. 4d. per share on the second issue of shares (Act, 1875), £11 paid, being at the rate of 4 per cent. per annum. This will absorb £5306 13s. 4d., leaving a balance of £405 2s. 11d. to be carried to the credit of next half year's account.

**ADOPTION OF THE BURGHS GAS SUPPLY (SCOTLAND) ACT AT KIRKINTILLOCH.**—A poll to decide as to the adoption of, and application to the burgh of the Gas Supply (Scotland) Act, 1876, took place on the 26th ult. The poll was rendered necessary by a remonstrance against the adoption of the Act, signed by 34 ratepayers, and lodged with the Town Clerk. The vote was taken in the manner prescribed for the adoption of the General Police Act, 1862, prior to the passing of the Ballot Act, and the voting was open. The numbers polling were—for the adoption of the Act, 281; against its adoption, 85.

**EXTRAORDINARY ACCIDENT AT MARYHILL.**—On Tuesday evening, while a road steamer, drawing an old boiler, was passing over the bridge that spans the Kelvin, one of the wheels of the bogie carriage sank so deep in the soft ground as to break the pipe that supplies Kelvindale village and works with gas, the result being an explosion of gas under the boiler, and the damaging of the woodwork of the carriage by fire. It was attempted to stifle the flames by throwing earth into the opening, but they soon burst out again on different parts of the bridge, about a dozen large tongues of fire shooting out from between the stones at the spring of the arches. An effective remedy, however, was found in cutting the pipe on the Maryhill side of the Kelvin.

**PURCHASE OF THE SAFFRON WALDEN GAS AND WATER WORKS.**—On Thursday last Mr. S. J. Smith, C.E., one of the Inspectors of the Local Government Board, visited the borough, and held an inquiry on the proposed purchase of the gas and water works by the Corporation. The price of the gas-works was said to be £10,300, and of the water-works £6400. Power is sought to borrow the money on mortgage of the lands and plant. The gas-works were established in 1836, with a capital of £9260, divided into shares of £20 each, and the Shareholders have received 5 per cent. dividend. Six million feet is the yearly consumption. The average income is £600. The state of the works was reported as good, but they require extension. The grounds of the application were the general utility of the change and the benefit to the public by the reduction of the rates. The profit, it was said, will pay the money borrowed in 40 years by instalments. The Shareholders were not anxious to sell, but lent a willing ear to the sacrifice to benefit the town. The water-works inquiry was adjourned, on the ground that the water analysis was unsatisfactory; and Dr. Frankland was appointed to make a fresh analysis. The Inspector inspected both the works.—*Colchester Mercury*.

**HASTINGS PUBLIC LIGHTING.**—At the monthly meeting of the Hastings Town Council on Friday last, the Committee appointed to take into consideration the price of gas recommended the Council to enter into a contract with the Gas Company to supply the public lamps for five years at the rate of £4 5s. 6d. per lamp, which terms had been offered by the Company. Mr. Winter moved the adoption of the report, stating that the Committee found they would have had to pay more if the gas were supplied by meter. It was very desirable that the Council should be in a definite

position with regard to the public supply of gas, and he had no objection to the proposed contract. Mr. Bradnan complained that the Gas Company had not come forward so willingly as they might have done. Alderman Williams regretted the action of the Committee, who had the power to call in the services of an engineer to report upon the cost of new works, &c., but who preferred to negotiate with the Gas Company for the supply of gas. Mr. Vernon defended the action of the Committee, and declared that the terms offered by the Company were very fair. Mr. Hill said the Committee thought they had better not call in the services of an engineer, especially as they would have no power to erect new works without an Act of Parliament. The Committee's recommendation was adopted, eleven voting for the motion and one against it.

## Register of New Patents.

3551.—JOHNSON, J. H., Lincoln's Inn Fields, London, “Improvements in the treatment of the iron residues obtained in the purification of coal gas, and in the obtaining of products therefrom.” Patent dated Sept. 9, 1876.

This invention relates to the extraction of certain products which are contained in what is known as spent oxide or oxides of iron, the residue result of the employment of oxide or oxides of iron in the purification of coal gas, and it consists—

1. In submitting the spent oxide or oxides of iron to the action of water in order to separate the soluble salts or compounds of ammonia which have been formed and which are contained therein. The solution, thus obtained, containing the salts and compounds of ammonia, may then be evaporated, so as to crystallize out the same, or the ammonia may be liberated therefrom, and be obtained by distillation.

2. In submitting to a levigating or washing process, or to such a process as shall, by the aid of water, eliminate the sawdust usually mixed with such coal gas purifying agent or agents.

3. In submitting the residual spent oxide or oxides of iron, either in their crude or in their levigated or washed condition, as before mentioned to the action of a solution of a caustic alkali, or to the action of an alkaline earth, such, for example, as caustic lime, in order that the sulphur contained therein may be dissolved out and be separated therefrom.

4. Effecting the separation of the solution thus obtained from the insoluble residue, and then submitting it to the action of an acid, for example hydrochloric acid, in order that a portion of the sulphur contained therein may be liberated and be precipitated.

5. After the sulphur has been deposited, the products capable of producing colours or colouring matters, which may be contained in the supernatant or clear solution, are to be precipitated by the employment of a proto or other salts or compounds of iron, either alone, or in conjunction with an oxidizing agent, such, for example, as chloride of lime. Or, instead of employing compounds of iron, either alone, or in conjunction with an oxidizing agent, the oxidizing agent may be employed after the colour compound has been precipitated, and such oxidizing agent may be either chloride of lime, nitric acid, or a mixture of sulphuric and nitric acids, or chromate of potassium, with an acid, or chromic acid; or other oxidizing agents may be employed.

3598.—HORTON, H., 7, Finsbury Street, London, “Improvements in globe holders suitable for gas and other lamps.” Patent dated Sept. 14, 1876. At a convenient distance below the flame or jet is fixed a horizontal, circular, or other shaped plate or carrier, in the periphery of which are slots through which the upper extremities of these improved globe-clips are passed, the lower extremities thereof being attached to and actuated by a screwed nut, or spring, working on or round the jet or lamp-tube, and situated at any convenient distance below the carrier. The clips may be of rigid metal, and jointed, or of springs without joints, or of a combination of both. On propelling the nut downwards the clips approach radially, and firmly nip the rim of the globe in a concentric position. On propelling the nut upwards, that is to say, reversing the action, the upper or hooked ends of the clips recede radially, and release the globe, which may then be removed.

3655.—FOULIS, W., Glasgow, “A new or improved gas governor.” Patent dated Sept. 19, 1876.

This invention, which relates to a new arrangement or construction of governors for regulating the distribution of gas, is applicable either as a station governor or as a district governor.

[The apparatus was described and illustrated in the JOURNAL, Vol. XXIX., p. 660.]

3656.—WILKINS, S. B. W., Edinburgh, “Improvements in ball-cock hydrants.” Patent dated Sept. 19, 1876.

This invention, which relates to improvements in ball-cock hydrants, has for its object to provide a clear water-way in the valve chamber, and thereby to secure an uninterrupted passage for the water, and so obviate any reduction of the pressure from obstruction of the ball. On the stand-pipe being applied to dislodge the ball from the mouth of the hydrant, instead of forcing it into the throat of the supply-pipe, as hitherto done, it is, under this invention, forced to the bottom of a chamber or recess directly open to the supply-pipe, and preferably placed at one side thereof. The water from the main is free to pass from the supply-pipe to the mouth of the hydrant, and thence through the hose for the purpose desired, without having its pressure diminished, and without being otherwise obstructed by the ball. On the pressure of the stand-pipe being removed, the ball rises into the mouth of the hydrant, where it is retained by the pressure of the water underneath. The hose is attached to the hydrant in any approved manner.

3674.—HARRIS, R., Bow, “Improvements in the purification of gas.” Provisional protection only obtained. Dated Sept. 20, 1876.

This invention has for its object effecting an economy in the cost of purifying gas, and it consists in the utilization, as the purifying agent, of spent lime which has hitherto formed a refuse substance of little commercial value. In carrying out the invention, lime is used in dry lime purifiers in the ordinary manner, and when it is saturated with impurities, it is ventilated in the purifiers by drawing or forcing air through the lime, either with or without steam. It is then removed from the purifiers, turned over and damped to the usual consistency of purifying lime, and then used again in the purifiers in lieu of clean lime. This process is repeated by re-utilizing it until it ceases to be operative.

## APPLICATIONS FOR LETTERS PATENT.

314.—WILSON, W. V., Mile End, London, “Improvements in the manufacture of cyanogen products from gas residues.” Jan. 24, 1878.

320.—DORENDORFF, R., Manchester, “Improvements in prime movers, applicable also wholly or in part in the construction of apparatus for pumping, exhausting, or forcing fluids.” A communication. Jan. 24, 1878.

342.—SUFFIELD, T., Bermondsey, and HOLLANDS, W. E., Brighton, “Improvements in hydrants or fire-cocks.” Jan. 26, 1878.



- 363.—CLARK, A. M., Chancery Lane, London, "Improvements in and connected with apparatus for filtering water." A communication. Jan. 28, 1878.
- 376.—DANCHELL, F. L. H., Camden Town, London, "Improvements in filter presses." Jan. 29, 1878.
- 382.—WIGHAM, J. R., Dublin, "Improvements in apparatus for producing or enriching combustible gas for illuminating purposes, more particularly applicable for illuminating lighthouses." Jan. 30, 1878.
- 390.—MORGAN-BROWN, W., Southampton Buildings, London, "Improvements in steam-pumps for compressing or exhausting air or gases with or without fluids." A communication. Jan. 30, 1878.
- 407.—HOBBS, G. W., Market Harborough, Leicester, "Improvements in pumps." Jan. 31, 1878.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 3024.—MILLS, E. C., and HALEY, H., Manchester, "Improvements in motive-power engines worked by the explosion of gas." Aug. 8, 1877.
- 3252.—DERBYSHIRE, J., Longton, Stafford, "Improvements in filter presses." Aug. 27, 1877.
- 3956.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in hydrants." A communication. Oct. 25, 1877.

PATENTS WHICH HAVE BECOME VOID.

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.
- 135.—SCOTT, H. Y. D., "Improvements in the purification of coal gas." Jan. 13, 1875.
- 150.—RYDELL, G., "Improvements in machinery and apparatus in the construction and working of vessels, tanks, reservoirs, and areas, and materials used for the purification of sewage and other polluted waters." Jan. 14, 1875.
- 184.—WALLER, G., "Improvements in apparatus used in the manufacture of gas." Jan. 18, 1875.
- 214.—BOX, J., AUBERTIN, E., BOBLIQUE, L., and LEPLAY, H., "Improvements in the disinfection of solid and liquid matters, such as night-soil sewage, either together or separately, gas, and other foul waters." Jan. 20, 1875.
- 227.—BLAKEBOROUGH, R., and BECK, J., "Improvements in hydrants and fire-cocks." Jan. 21, 1875.
- 261.—COLEBROOK, C. T., "Improved means or apparatus for raising water from wells or other places, or for raising other liquids." Jan. 23, 1875.
- 269.—ALLEN, W., "Improvements in machinery for raising and forcing fluids and liquids." Jan. 23, 1875.

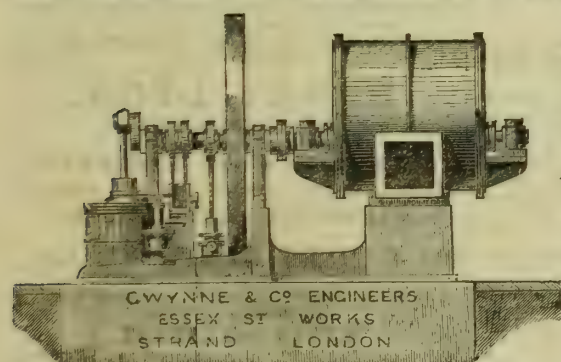
Share List of Metropolitan Gas and Water Companies.

(Corrected by Mr. F. N. GOLDING, Sun Court, Cornhill, from the latest Stock Exchange Quotations.)

Number of Shares issued.	Amount paid up per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent.	Latest Quotations.	Number of Shares issued.	Amount paid up per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent.	Latest Quotations.	Number of Shares issued.	Amount paid up per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent.	Latest Quotations.
10000	£ 20	Anglo-Romano	£ s. d. 20 0 0	9 0 0	20-25	56000	50	Imprl. Continental	£ s. d. 45 15 0	5 1/2 p.sh.	91-93	1500	10	Wandsw. & Putney	£ s. d. 10 0 0	10 0 0	19-20
5000	20	Bahia (Limited)	20 0 0	3 0 0	10-11	9000	5	Limerick Gas	5 0 0	2 10 0	3-3 1/2	1500	10	Do.	10 0 0	7 10 0	11-12
1000	20	Do., do., redeem	20 0 0	10 0 0	..	383000	Sk.	London	100 0 0	10 0 0	195-200	2957	10	Do.	10 0 0	7 0 0	..
1500	20	Do., 2nd pref.	20 0 0	7 10 0	..	150000	Sk.	Do., 1st pref.	100 0 0	6 0 0	135-140	993	10	Do.	3 0 0	7 0 0	..
40000	5	Bombay (Limited)	5 0 0	7 10 0	7-7 1/2	14450	Sk.	Do., 2nd pref.	100 0 0	6 0 0	120-130	26000	5	West Ham	5 0 0	10 0 0	8-9
10000	5	Do., fourth issue	4 0 0	7 0 0	5-5 1/2	4350	Sk.	Do., 3rd pref.	100 0 0	6 0 0	120-130						
14000	20	British (Limited)	20 0 0	10 0 0	38-40	7622	25	Do., A shares	25 0 0	5 0 0	32-34						
7500	20	Cagliari (Limited)	20 0 0	5 0 0	15-16	26805	1	Do., Debent. stk.	100 0 0	5 1/2 & 6 1/2	..						
55000	Sk.	Commercial	100 0 0	10 0 0	195-200	15000	5	Malta and Mediteranean (Limited)	5 0 0	2 0 0	2-2 1/2						
70000	100	Do., 7 per cent.	..	..	140-144	6000	5	Do., preference	5 0 0	7 10 0	5-5 1/2						
20000	20	Continental Union	20 0 0	6 0 0	20-21	29000	5	Mauritius (Limited)	2 5 0	2 10 0	3-1						
20000	20	Do., new	12 10 0	6 0 0	14-15	25000	10	Monte Video (Lim.)	20 0 0	8 0 0	17-18						
10000	20	Do., preference	20 0 0	7 0 0	24-26	8000	20	Nietheroy, Brazil (Limited)	10 0 0	5 0 0	..						
75000	Sk.	Crystal Palace District	100 0 0	10 0 0	195-200	30000	5	Oriental (Calcutta)	5 0 0	9 10 0	7 1/2-7 3/4	12000	100	Chelsea	100 0 0	5 0 0	150-154
125000	Sk.	Do., 7 per cent.	100 0 0	7 0 0	138-142	30000	5	Do., new shares	3 0 0	9 10 0	1 1/2-1 3/4	1800000	50	East London	100 0 0	6 0 0	151-155
50000	Sk.	Do., preference	100 0 0	6 0 0	125-135	10000	5	Ottoman (Limited)	5 0 0	3 0 0	2-3	8000	25	Grand Junction	50 0 0	5 0 0	81-83
23400	10	European (Limited)	10 0 0	10 0 0	17-18	10000	10	Para (Limited)	10 0 0	2 0 0	4 1/2-5 1/2	5840	25	Do., 4 shares	25 0 0	5 0 0	40-41
12000	10	Do., new shares	7 10 0	10 0 0	0 6-7 p.xd.	27000	20	Phenix	20 0 0	10 0 0	38-40	2160		Do., new ditto	..	..	..
35400	10	Do., new shares	5 0 0	10 0 0	0 34-4 1/2	360000	100	Do., new max. 7 1/2	60 0 0	7 10 0	109-114			max. div., 7 1/2 p.c.	25 0 0	5 0 0	33-34
409440	Sk.	Gaslight & Coke A.	100 0 0	10 0 0	0 198-203	144000	Sk.	Do., capitalized	100 0 0	5 0 0	103-106	547960	100	Kent	100 0 0	8 0 0	202-207
100000	Sk.	Do. B.	100 0 0	4 0 0	80-85			Do., new, 1876	..	..	14-15 pm	970		Lambeth	100 0 0	6 0 0	151-155
5000	10	Do. 5 per ct. pref. conv., 4th issue	10 0 0	5 0 0	0 17 1/2-18 1/2	37500	20	Rio de Janeiro (L.)	20 0 0	10 0 0	29-31	1161	100	Do., max., 7 1/2 p.c.	100 0 0	6 0 0	148-152
5000	10	Do. do. 5th do.	4 0 0	5 0 0	0 6 1/2-7 1/2 pm	7359	5	Singapore (Limited)	5 0 0	7 10 0	5 1/2-5 3/4	442	100	New River	100 0 0	7 0 0	320-350
200000	Sk.	Do. C 10 p.c. pref.	100 0 0	10 0 0	0 210-215	2000	5	Do., preference	5 0 0	7 10 0	5 3/4-6 1/2	4475	100	Do., deb. sk., 4 p.c.	100 0 0	4 0 0	103-105
300000	"	Do. D do. do.	100 0 0	10 0 0	0 210-215	1500	32 1/2	Shanghai	32 10 0	12 0 0	30-32	400000	100	Southwark & Vauxh.	100 0 0	2 0 0	99-102
165000	"	Do. E do. do.	100 0 0	10 0 0	0 210-215	4000	50	South Metropolitan	50 0 0	11 0 0	108-111	3036	100	Do., pref. stock	100 0 0	5 0 0	116-118
300000	"	Do. F 5 do. do.	100 0 0	5 0 0	0 108-107	4000	12 1/2	Do.	12 10 0	10 0 0	25-27	1296	100	Do., D shares	100 0 0	4 0 0	98-100
60000	"	Do. G 7 1/2 do. do.	100 0 0	7 10 0	0 145-153	20000	12 1/2	Do., new shares	10 10 0	10 0 0	13 1/2-14 1/2	..		Do., new ordinary	..	..	..
1300000	"	Do. H	100 0 0	7 0 0	0 142-145						pm.			Do., new ord. No. 1	40 0 0	4 0 0	..
6200	5	Georgetown, Guiana	5 0 0	5 0 0	..	15000	10	Survey Consumers	10 0 0	10 0 0	15-20	1600	100	West Middlesex	61 0 0	6 1/2 p.sh.	138-141
5800	10	Hong Kong (Lim.)	10 0 0	10 0 0	18-20	10000	10	Do., new	10 0 0	10 0 0	7 1/2-8 1/2	12172	61				

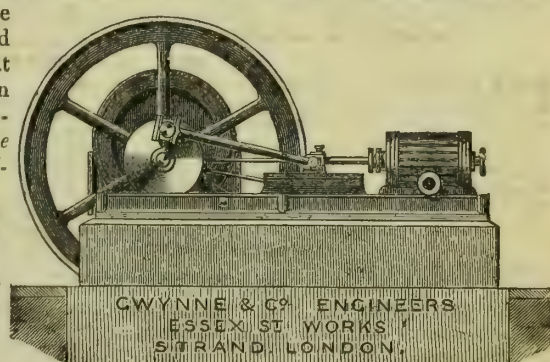
The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

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TO GAS ENGINEERS.

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Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

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**WANTED, Readers of the Pamphlet,**  
"Cooking and Heating by Gas," &c.  
Copies, by post, Threepence, direct from the Author,  
MAGNUS OHREN, Gas-Works, SYDENHAM, S.E.

**WANTED, Orders for Samples to test**  
the superior Silketone, Wigan, and other Gas Coals  
and Cannel on Sale by G. J. EVESON, Gas Coal and Cannel  
Contractor, BIRMINGHAM.  
N.B.—Prices on personal application, or by post or tele-  
gram, on shortest notice, and prompt delivery.

**WANTED, a clean Copy of the Report**  
of Proceedings of the Ninth Annual Meeting (1870)  
of the North British Association of Gas Managers. 2s. 6d.  
will be given.  
Address No. 434, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

**WANTED, a situation as Stoker, by a**  
young Man. Has practical knowledge of Meter  
Inspecting, Collecting, and Book-keeping. Will be willing  
to make himself useful at a small Works. No objection  
to go abroad.  
Address No. 433, care of Mr. King, 11, Bolt Court, FLEET  
STREET, E.C.

**WANTED, a Working Manager to**  
take charge of a small Gas-Works in the Midland  
Counties, where the make is about 8 millions. He must  
be capable and of steady habits, and have good recommen-  
dations.  
Apply to Mr. PENNY, C.E., 20, Abingdon Street, WEST-  
MINSTER.

**WANTED, in a Provincial Gas-Works,**  
a steady practical Man, who is a good Carbonizer,  
as YARD FOREMAN. Also an experienced hand for  
Meter Repairs. Liberal wages to competent men.  
Forward copies of testimonials, with references,  
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FLEET STREET, E.C.

**WANTED, a Working Foreman,**  
thoroughly competent to manage a small Works in  
the country, taking the registration of meters, and fitting  
same. An assistant allowed in the winter months. House,  
&c., on the premises. Must have filled a similar situation,  
and be a total abstainer.  
Apply, by letter, to No. 436, care of Mr. King, 11, Bolt  
Court, FLEET STREET, E.C.

**WANTED, by Samuel Thompson & Co.,**  
Colliery Office, Lancaster, APPLICATION for  
PRICES from Gas Managers who are prepared to receive  
Tenders for GAS COAL or CANNEL.  
John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his  
analytical report of S. T. & Co.'s Coal, says: "It is  
remarkable for its purity, I have scarcely ever examined a  
Coal containing so small a quantity of ash, and when Cannel  
of the best description is scarce, it may well replace this  
material."

**A Firm calling on, and in correspondence**  
with, every Gas Company in the Kingdom is open  
to undertake a COMMISSION for the SALE of any  
ARTICLES consumed in the Manufacture of Gas.  
Address, M. N., at Horncastle's Central Advertisement  
Offices, 61, CHEAPSIDE, E.C.

**ON SALE—One Station-Meter, to pass**  
1000 cubic feet per hour. Almost new. Will be sold  
cheap.  
Apply to J. HALL, Gas-Works, St. Helen's, LANCs.

**FOR SALE—A First-Class Station-**  
METER, to pass 20,000 cubic feet per hour. May  
be seen at work. It is to be disposed of to make room  
for one of greater capacity.  
Apply to E. GODDARD, Gas-Works, IPSWICH.

#### BOROUGH OF HALIFAX.

TO BRASS AND IRON FOUNDERS.  
**THE Gas-Works Committee of the Cor-**  
poration are prepared to receive TENDERS for sup-  
plying Brass GAS COCKS and Wrought-iron TUBING for  
a period of Twelve months.

Forms of tender and any further information may be ob-  
tained on application to Mr. William Carr, Gas-Works  
Manager, Halifax; and tenders, properly endorsed, must be  
sent to me on or before Thursday, the 21st of February,  
1878.

By order,  
A. C. FOSTER, Town Clerk.  
Town Hall, Halifax, Feb. 1, 1878.

CITY OF CARLISLE.  
**THE Gas Committee of the Corporation**  
of Carlisle are prepared to receive TENDERS for  
the construction of a Concrete TANK, about 124 ft. dia-  
meter by 30 ft. deep.

Plans and specifications may be seen at the Gas-Works  
on and after Feb. 4, 1878, and copies of the specification  
may be obtained on payment of One Guinea.  
Sealed tenders, addressed to the "Chairman of the Gas  
and Water Committee," and endorsed "Tender for Tank,"  
to be delivered at the Gas-Works not later than Feb. 14,  
1878.

The lowest or any tender not necessarily accepted.  
J. HEPWORTH, Engineer and Manager.  
Gas-Works, Carlisle, Jan. 28, 1878.

#### MANCHESTER CORPORATION GAS-WORKS.

TO COLLIERY PROPRIETORS & OTHERS.  
**THE Gas Committee will receive, on the**  
25th day of March next, TENDERS of CANNEL  
and COAL, for delivery at their Works, situated at Gay-  
thorn and Rochdale Road, over a period of One or more  
years, from the 30th day of June next (tenders for Three or  
Five years will have the preference), and the Committee  
are now prepared to receive applications for permission to  
send in samples.

Sealed tenders, stating price and quantity proposed to be  
delivered at each Station, the rate and period of delivery,  
and endorsed "Tender for Cannel" or "Coal," as the case  
may be, must be addressed to the Chairman of the Gas  
Committee, and delivered at this Office on or before Mon-  
day, the 26th day of March next.

The Committee do not bind themselves to accept the  
lowest or any tender.

By order,  
JOSEPH HEYRON, Town Clerk.  
Gas Department, Town Hall, Jan. 30, 1878.

**THE Salford Corporation are prepared**  
to receive TENDERS for the erection, at their  
No. 2 Gas Station, Regent Road, of a TELESCOPIC GAS-  
HOLDER, about 151 feet diameter, with two lifts, each  
about 40 feet deep.

The plans and specification can be seen, and all necessary  
information obtained, on application to the Engineer, Mr.  
Samuel Hunter, Gas-Works, Lamb Lane, Salford.

Tenders, endorsed "Tender for Gasholder," must be  
delivered to me, on or before Feb. 12, 1878.

The Corporation do not bind themselves to accept the  
lowest or any tender.

By order,  
CHRIS. MOORHOUSE, Town Clerk.

#### HINDLEY LOCAL BOARD'S GAS-WORKS.

**THE Hindley Local Board are prepared**  
to receive TENDERS for about 300 tons of 8-inch.  
and 9-inch. Cast-Iron GAS-PIPES.  
Specifications, quantities, and forms of tender may be  
had on application to the undersigned.

Tenders, endorsed "Gas-Pipes," to be sent to R.  
Pennington, Jun., Esq., Chairman, Local Board Offices,  
Cross Street, Hindley, near Wigan, on or before Friday,  
Feb. 8, 1878.

The Local Board do not bind themselves to accept the  
lowest or any tender.

By order,  
STEPHEN HOLT, Clerk to the Board.

Jan. 24, 1878.

#### TO PROPRIETORS OF FIRE-CLAY, MANUFACTURERS OF CLAY RETORTS, AND OTHERS.

**THE Directors of the Rochester, Chat-**  
ham, and Strood Gaslight Company are prepared to  
receive TENDERS for the supply of about 1200 feet run of  
CLAY RETORTS, sundry FIRE-BRICKS, and 80 tons of  
CLAY.

Forms of tender may be had on application, and must be  
delivered, marked "Tender for Retorts," &c., on or before  
Wednesday, the 20th of February inst.

W. SYMS, Secretary.

56, High Street, Rochester, Feb. 4, 1878.

#### BOROUGH OF NEATH.

**THE Gas Committee of the Town Council**  
hereby invite TENDERS for the purchase of the  
whole of the surplus TAR and SULPHATE OF AMMONIA  
to be produced and manufactured at their Works, situate  
at the Milllands, adjacent to the Great Western Railway,  
Neath, for a period of One, Two, or Three years from the  
1st of March, 1878.

Sealed tenders, quoting prices for delivery into buyers  
trucks, at the Gas-Works, to be sent to Town Clerk's Office,  
Neath, not later than the 27th of February next.

Further particulars (if required) may be obtained on ap-  
plication to the Manager, at the Works.

By order,  
ALFRED CURTIS, Clerk to the Committee.  
Neath, Jan. 19, 1878.

#### TO BUILDERS, CAPITALISTS, AND OTHERS. GOSWELL ROAD—FREEHOLD SITE.

**THE Directors of The Gaslight and Coke**  
Company are prepared to receive TENDERS for the  
purchase of the above PROPERTY, comprising 67,000  
square feet, or thereabouts. A plan of the Property can be  
seen at the Company's Offices, 148, Goswell Road, on  
application to Mr. J. Johnson.

Tenders should be addressed to me on or before Thurs-  
day, the 14th prox., and endorsed "Tender for Land—  
Goswell Road."

The person whose tender is accepted will be required to  
deposit with the Company's Bankers the sum of £2000,  
but the Directors do not bind themselves to accept the  
highest or any tender.

By order,  
JOHN ORWELL PHILLIPS, Secretary.  
Chief Office, Horseferry Road,  
Westminster, S.W., Jan., 1878.

#### IMPERIAL CONTINENTAL GAS ASSOCIATION BILL.

An EXTRAORDINARY MEETING of the PROPRIETORS  
of the Imperial Continental Gas Association was held  
at the City Terminus Hotel, Cannon Street, in the  
City of London, on THURSDAY, the 31st ult., for the  
purpose of considering the provisions of the Bill now before  
Parliament, intitled "A Bill for Granting further Powers  
to the Imperial Continental Gas Association." In the un-  
avoidable absence of Mr. Julian Goldsmid, M.P., the  
Chairman, Henry Wood, Esq., was voted into the Chair,  
when the following Resolutions were passed:—

Moved by the Chairman (Mr. Wood), seconded by Mr.  
Chandler, and resolved unanimously—  
"That this Meeting approves of the Imperial Continental  
Gas Association Bill now before Parliament, subject to any  
alterations which, with the concurrence of the Directors,  
may be made in the Bill in its progress through Par-  
liament."

Resolved unanimously—  
"That a cordial vote of thanks be given to the Chairman  
for his conduct in the Chair this day."

ALBERT F. JACKSON, Secretary.  
(By order of the Board.)

Dated the 1st day of February, 1878.

#### THE GASLIGHT & COKE COMPANY.

Chief Office, Horseferry Road, Westminster, S.W.,  
Jan. 28, 1878.

NOTICE is hereby given that a HALF-YEARLY  
ORDINARY GENERAL MEETING of the PROPRIETORS  
in this Company will be held at this Office, on  
FRIDAY, the 15th day of February next, at Twelve o'clock  
(noon) precisely, to transact the usual business, including  
the declaration of a Dividend for the half year ending the  
31st day of December last, and to elect Directors and  
Auditors in the place of those who will at such Meeting go  
out of office.

NOTICE is hereby also given that at such Meeting the  
Directors will apply to the Proprietors for authority to  
raise, by the creation and issue of Debenture Stock, the  
sum of £125,000, under the powers of the Company's Act  
of 1872; also for authority to dispose of such further por-  
tion of the Company's property as is not now required for the  
purposes of their undertaking.

By order,  
JOHN ORWELL PHILLIPS, Secretary.

Second edition, just published, with Folding Plates, &c.,  
2s. 6d. (postage, 2d.).

#### COMMON SENSE for GAS USERS: A

Catechism of Gas Lighting for Household, Gas-  
Fitters, Millwrights, Architects, Engineers, &c. By ROBERT  
WILSON, C.E., Author of "A Treatise on Steam Boilers."  
"All gas users will decidedly benefit, both in pocket and  
comfort, if they will avail themselves of Mr. Wilson's  
counsels."—*Engineering*. "Mr. Wilson's book is tho-  
roughly admirable."—*Engineer*.

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#### THE GAS COMPANIES EXPENDITURE JOURNAL.

Being a Ruled Account-Book with Printed Headings,  
and Analyzing Guide for Keeping, upon the easiest  
and most correct method, the Expenditure of a Gas  
Company, in accordance with the provisions of the  
Gas-Works Clauses Act of 1871, and suitable for all  
Companies.

Published by EDWARD SANDELL, Accountant,  
2, Great George Street, WESTMINSTER, and W. B. KING,  
Office of the JOURNAL OF GAS LIGHTING, 11, Bolt  
Court, FLEET STREET, E.C.

#### MR. EDWARD SANDELL,

Associate of the Society of Accountants in England,

Publisher of the

"Gas Companies Expenditure Journal,"

Begs to announce his REMOVAL from Skinner's Place,  
Sise Lane, to

No. 2, GT. GEORGE STREET, WESTMINSTER.

#### REMOVAL.

**CHARLES HEISCH, F.C.S., Analytical**  
and Consulting Chemist, Superintending Gas  
Examiners to the Corporation of London, &c., &c., has  
REMOVED from 8, Savage Gardens, to 79, MARK LANE,  
where he may be consulted as usual.

#### ALFRED LASS,

SPECIAL ACCOUNTANT FOR GAS COMPANIES,  
30, GRACECHURCH STREET, LONDON.

Accounts analyzed and Statistics Prepared for Parlia-  
mentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially  
designed by A. L. to meet the requirements of the Gas-  
Works Clauses Amendment Act, 1871, are now in use by  
many Gas Companies, and have been universally approved.  
The above forms are registered.

Water Companies Accounts also prepared and adjusted.  
CONSULTATIONS.

#### HENRY LYON, ENGINEER,

AND

CONSULTING GAS ENGINEER,  
BARTON HOUSE, opposite BARTON ARCADE,  
DEANSGATE, MANCHESTER.

#### Mr. ROBERT DEMPSTER, Sen.,

CONSULTING GAS ENGINEER,

Of Messrs. Robert Dempster and Sons, Rose Mount

Gas Engineering Works,

ELLAND, near HALIFAX,

May be consulted on all matters connected with Valuations,  
Arbitrations, and Parliamentary Applications connected  
with Gas-Works. Our R. D., Sen., having been engaged  
on extensive Arbitration Cases, which, combined with his  
experience in Construction and Contracting, his knowledge  
of Engineering and Valuations, is both extensive and  
reliable.

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## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

R. H. The Blackburn Gas-Works were transferred to the Corporation of Blackburn last year. The terms agreed upon were as follows:—The holders of £15 A shares fully paid, entitled to 10 per cent. dividends, obtained perpetual annuities equal to maximum dividends, and a bonus of £2 per share; the holders of £15 B shares fully paid, entitled to 7½ per cent. dividends, also received annuities equal to maximum dividends, and a bonus of £2 per share; the holders of £10 C shares, upon which £5 only had been paid, received annuities of 7 per cent. on the amount paid up, and a bonus of £3 10s. per share.

## THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 12, 1878.

## Circular to Gas Companies.

THE report of the Directors and the accounts of the Chartered Gas Company, for the past half year, have been issued, in anticipation of the General Meeting to be held on Friday, the 15th inst. The accounts show that the Company have again done a good half year's business. The receipts for common gas amounted to £775,386, which is £212 in excess of the corresponding half of 1876. The amount of the excess is small, but it is remarkable, seeing the reduction made in the price of gas in the interim. As might be expected, the receipts for cannel gas have decreased. This was inevitable, seeing that its limited consumption admits of no extension. Perhaps no item of receipt shows the progress made by the Company better than the meter-rents. These, in the past half year, have exceeded by £709 those of the corresponding half of 1876. Every new meter indicates an additional consumer. As to residuals, we have to notice the decrease in the value of coke, which is not remarkable, seeing the reduced price of coal. The value of tar fluctuates so much, that a decrease of £11,500 is not to be wondered at. Ammoniacal liquor is a commodity of stable value, and it is not surprising that, considering the increased quantity made, the receipts for this article were £3117 in excess of those of the corresponding half of 1876. Summing the whole up, the accounts show that the total receipts of the Company were £1,152,445, being a de-

crease of £28,540. This decrease is, of course, readily accounted for, and the only wonder is that it is not greater.

Turning to expenditure, we find a similar gratifying state of things. There is a decrease on almost every item. In coals the decrease is as much as could have been expected, considering the larger amount carbonized. A noticeable item is the cost of purification, which shows a decrease of £5071, when compared with the cost of the corresponding half of the previous year. We should be glad to know how this saving has been effected. It has certainly not been done at the expense of efficiency, for, taking all the stations into account, the Company's gas has never been better purified than during last half year. Putting together the whole of the expenses of manufacture, we notice a decrease of £10,861, as compared with the corresponding half of 1876. The worst enemy of the Company will admit that this one fact indicates highly efficient management. No less satisfactory, considering the extensions, is the decrease in the expenses of distribution, which, compared as before, amounts to £3287. In the cost of management, we notice an increase of only £793, which, considering the amount of additional business, we quote as an indication of the desire to promote economy. We note also one very gratifying particular, that the parliamentary expenses of the half year only amounted to £9. Those who so strongly object to the superannuation allowances—in some cases so hardly earned, and in all others justified on legal and moral grounds—will notice with satisfaction that these have undergone considerable reductions. The total expenditure on revenue account having been £760,455, and the receipts amounting to £1,152,445, the balance of gross profit to be carried to net revenue is £391,990, which, in consequence of the reduction in the price of gas, is necessarily less than the gross profit of the corresponding half of 1876. Reviewed as a whole, however, the revenue accounts must be regarded as of the most satisfactory character. They show efficient management, combined with economical arrangements, and are quite sufficient to allay all the distrust with which this particular Company have been so unjustly regarded.

Passing to the distribution of profits, we find that after payment of interest on borrowed money and dividends on preference shares, there remains a balance, which, added to that carried forward from previous half years, gives a sum of £326,536 applicable to the payment of dividends on ordinary share capital. This admits of the payment of full statutory dividends, as they were once called, and also allows the transfer of £30,640 to the reserve-fund, leaving a balance of £91,030 to be carried forward. It will thus be seen that, under the operation of the sliding scale, the Directors might have recommended the distribution of a larger dividend than ten per cent.; but we shall not question the soundness of their policy in adding as much as they can to their reserve-fund, and carrying forward a large balance. There are, no doubt, many Shareholders who, as times are at present, would have preferred the larger dividend, but the Directors have followed a provident course, for which the Shareholders may be grateful.

With reference to the details of manufacture, we may note that these are of the usual satisfactory character. The quantity of coal carbonized during the past half year was 521,540 tons, being an increase of 17,441 tons over the amount carbonized in the half year corresponding. This shows that the daily amount of coal carbonized was over 2860 tons. The make of gas from this quantity of coal was 5,405,198 thousands of cubic feet, which gives an average yield of about 10,050 feet per ton. Of this, so much is accounted for, that the loss by leakage is found to amount to only just about five per cent. We imagine it will be impossible to further reduce the leakage, and the fact that it has been brought so low reflects infinite credit on the officers of the Company. The progress of the business of the Company, and equally the extension of the Metropolis, are shown in the fact that since December, 1876, 522 public lamps have been added by them to those then standing in the streets; the total number now supplied by the Chartered Company being 34,844.

The report tells us that progress is being made in the construction of plant for the utilization of residuals. When this manufacture is in actual operation, we have little doubt but that a very considerable addition will be made to the yearly profits of the Company. As in a pig everything is eatable, so in gas-works everything is utilizable; not a particle of matter to be found in the works should be wasted. The waste which now results from lime purification may be easily avoided, and, for the rest, everything else is a saleable product.

A somewhat comical feature in the accounts and the report of the Directors is the allusion to the fine imposed upon the Company for an alleged deficiency of illuminating power in the gas supplied from one of their stations. The amount of the forfeiture—£74—looks ridiculously small; but, nevertheless, it is im-



portant, inasmuch as a great principle is involved. The money must be taken from funds applicable to dividend. The Act under which the forfeiture was incurred enacts that the simple certificate of a Gas Examiner shall be indisputable evidence of default in the absence of an appeal, or if the certificate be confirmed, on appeal, by the Chief Gas Examiner. We, last week, noticed some points on which the law required amendment. We do not know what are the provisions of the Bill which Mr. Stanhope, the Parliamentary Secretary of the Board of Trade, is about to introduce to the House of Commons; but we have, however, to urge that, under the Adulteration Act, which may be regarded as a typical enactment, a duplicate sample must be reserved for independent analysis. A duplicate sample of gas is impossible; and, therefore, we think it should be made imperative, that when any defect in the illuminating power is observed, immediate notice should be sent to the station from which the gas is supplied, so that an officer of the Company may attend at the testing-place, and verify the result. To call in the Chief Gas Examiner a week afterwards is a simple absurdity. He may, or may not, be able to attest the accuracy of the instruments; but of the quality of the article tested he can have no knowledge whatever.

Most probably the Bill, of which Mr. Stanhope has given notice—to “amend and consolidate the law relating to weights and measures”—is to include sections to amend the Sales of Gas Act; but, as indicated above, we hope it will go further. We reserve, however, further remark until we have the text of the Bill before us. A Government measure can always be added to. Perhaps a Bill “to amend and consolidate the law relating to weights and measures” may not be the proper vehicle in which to introduce an amendment in the law relating to the testing of gas; but we must press upon the Board of Trade the necessity for some alteration in the legislation with regard to it. Gas-testing is more or less a farce all over the country. It should be made real, or be left alone altogether. The General Act of 1871, now incorporated in every special Gas Act and Provisional Order, makes it imperative upon a Gas Company to set up a testing-station; but, in nine cases out of ten, these stations are never made use of by any Local Authority, or by any Examiner appointed by two Justices, upon the application of a number of consumers, and the Gas Company may be just as well saved the expense of the institution. If any alteration in the law be made, the appointment of a competent Examiner should be compulsory. It might, however, be difficult to find one in many places.

Under the old law, gas in the Metropolis was required to be tested three times a day, at intervals of an hour, during the hours of maximum consumption. Now-a-days, no particular hours are fixed, but it is required that gas shall be tested three times during the twenty-four hours. The letter of the law would, of course, be fulfilled if three testings were made, one after the other, as fast as the operator could make them; but the spirit of the Act, and the intention of the Legislature, would be utterly defeated by such a proceeding. We have a strong opinion that the old practice of testing in the evening hours was the best that could be adopted. But still an occasional day test would be a very proper thing. We allude to this matter, to call attention to the fact that the Metropolitan Board of Works have just appointed a single Examiner to do duty at Hill Street, Peckham, and Carlyle Square, Chelsea, which two stations are, as the crow flies, just about five miles apart. (We have not a book of cab fares to tell how many miles it is by road.) Now, an Examiner so able, active, intelligent, and conscientious as the gentleman appointed to the two stations, must find it extremely difficult to perform his duties with satisfaction to himself, to say nothing of the public. Boot-leather and cab hire are serious items of expense, and the salary of a Gas Examiner under the Metropolitan Board of Works is very small. The Board should take this matter into serious consideration.

It is useless to argue with some people. The Sheerness Local Board will wrangle with the Sheppy Gas Company about the price at which gas shall be supplied to public lamps, consuming on the average meter system. The object of the Board is to get gas at the same charge which is made to the Government for the Dockyard, but the absurdity of the proposal is evident. The law says that gas should be supplied to public lamps at the lowest price charged to private consumers, except under special contract. Now, the Government must be considered as a private consumer, taking gas under special contract, and the circumstances under which the Dockyard is supplied are so very different that no comparison can be made. Gas is taken by a main to the gates of the yard, is there measured by meter, and thereafter all that ensues is at the risk of the Government. This is a perfectly different thing to the supply of public lamps, which, in a town like Sheerness, involves the laying of long mains,

which are but little productive, and may involve much leakage. The proposal of the Town Council for a special rate is utterly preposterous. The Company are about to make a reduction of threepence per thousand feet, which will apply to public as well as private consumers, and with that the Board must be content.

The Corporation of Worcester have resolved on sending a deputation of six of their number to inquire of the Gas Company whether they are willing to dispose of their undertaking, and on what terms. We shall not anticipate the answer they will receive. More rubbish has, perhaps, seldom been talked than was uttered at a meeting of the Town Council of Worcester, which met to discuss the question. It is not our business to defend all the doings of Gas Companies, but we may express an opinion that on the whole the inhabitants of Worcester have been well served by their Gas Company. Constituted with peculiar restrictions, the Company seem to have fairly discharged their obligations. That the price of gas has not been lower, and that “the toiling small tradesmen,” as Alderman Woodward asserts, have been so greatly overtaxed, has not been the fault of the Company. Each party wanted the profits, and we sincerely hope the small tradesman has not gone without his. It is lamentable to hear bunkum of this sort talked in Town Councils. It introduces to the minds of the people communistic notions, which the speakers never intend to preach. We do not complain of Alderman Woodward’s original motion, which was that the Corporation should negotiate for the purchase of the undertaking, in consideration of annuities equal to maximum dividends. There are, however, in the case of the Worcester Gas Company, circumstances which must lead to the rejection of such bare terms. The undertaking, as it stands, is worth very much more than the capitalized amount of the maximum dividends. The case of the Hereford purchase was not inappropriately quoted.

An extraordinary meeting of the Town Council of York, to discuss the terms of the petition to be presented to Parliament against the Bill of the York United Gas Company, was held as we announced, and a modified petition was adopted, which left out every complaint of the neglect of the promoters of the Bill to make provision for the reduction of the ten per cent. dividends. It is a noticeable fact that Mr. Leeman, M.P., made a special journey to York to assist in the deliberations of the Council. The results of these conferences seem at present to be involved in a certain amount of mystery. Communications have taken place between the two parties, and one of two things may have happened. The Company may have decided to concede most of the points urged against them by the Corporation, or they may have consented to sell their undertaking on satisfactory terms. The appearance of a stormy petrel above the waves, like Mr. Leeman, looks ominous; but we shall continue to indulge a hope that the York United Company will succeed in carrying their Bill, and long continue to exist, and enlighten the citizens of York and their surrounding neighbours.

Much dissatisfaction is expressed with the gas supply of Dartmouth, and it seems to be admitted by the Company that their present works are scarcely adequate to maintain a sufficient supply over the town. Thereupon arises the usual question of setting all other things right by the purchase of the undertaking by the Town Council. In this case they are frankly told that the Council may have the works if they will pay a fair price for them, so probably we may soon hear of the transfer.

Full moons are frequently sources of difficulty and dispute at Dartmouth, and at the not far distant town of Honiton. Their splendour is often concealed behind thick clouds; but, according to contract, the lamplighter stays at home. No doubt much gas is wasted in public lamps, but, after all, a paltry saving effected by leaving them unlighted on moonlight nights is hardly worthy of consideration. Devonshire seems to be altogether in an uproar about gas, for Exmouth, too, is in a commotion on the subject, with very little to complain of, we think.

The Gas and Water Committee of the Ramsgate Local Board have now got fairly under way. They start with very wide powers, and claim, to a certain extent, independent action, with the proviso that, if the Board do not approve of their conduct, a new Committee may be appointed. One of their first duties was to receive the little bill of their Parliamentary Agent, amounting to £3545, disbursements out of pocket. Another bill is expected, which it is estimated will raise the total cost of last year’s parliamentary business to £5000. These are, of course, subject to taxation.

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BIDEFORD PUBLIC LIGHTING.—At the meeting of the Urban Sanitary Authority, on the 31st ult., it was resolved that the Clerk be instructed to advertise for tenders for lighting the town with gas, or otherwise, for a term not exceeding three years, or as may be agreed upon, from Lady-day next.



### Water and Sanitary Notes.

THE Vestries appear to be unanimous in opposing, at all events, the "Supply Bill" of the Metropolitan Board of Works. A dual supply is considered to be perfectly unnecessary, and it is fully recognized that a large amount of vexation, accompanied by no compensating benefit, would be caused by the introduction of the second supply. Nor is every one satisfied that any advantage would be derived from the purchase of the existing works. A strong suspicion exists, that the public might be very much worse off under the Board than under the Companies. More than a suspicion is entertained that the Board, as we have said before, already overworked, would prove quite incompetent to manage so vast a concern as the combined water undertakings. They would, it is true, have the assistance of very able Engineers, and must be, indeed, entirely at the mercy of their officers.

It is a noticeable fact, too, that the millowners, &c., in the surrounding chalk districts are bestirring themselves. These gentlemen recognize the danger, that the abstraction of a large amount of water for the supply of the Metropolis might have a seriously detrimental effect on the volume of water in their streams, and the quantity to be obtained for the necessities of their own districts. It is noteworthy that the Rev. J. C. Clutterbuck—a great authority on the water-bearing strata around London—comes forward and declares that the proposed operations of the Metropolitan Board of Works would inflict immense injury on the owners and occupiers of land, and proprietors of wells, in the neighbourhood of the spots where the new wells are to be sunk. Reviewing the whole case, we may express a confident opinion that the "Supply Bill" has no chance of success, and that the best course the Metropolitan Board could pursue would be to withdraw it at once. As regards the Purchase Bill, we shall wait for a few days to see what will turn up, but in the meantime may state our belief that its chance is as hopeless as the other. The Vestry delegates sitting in Spring Gardens have overshot the mark. We think they will presently be made to see the light in which the metropolitan public and Parliament regard them. So long as they have confined themselves to what may be called their legitimate operations, they have received a certain amount of support—never, however, very cordially conceded. Now, when they seek to load the Metropolis with a mountain of debt for a more than questionable advantage, that support entirely falls away, and failure stares them in the face.

The York New Water-Works Company have decided to issue new capital to the amount of £20,000, the dividend on which is to be limited to five per cent. until 1888. The dividend declared a few days ago on the old ordinary stock was eight per cent. per annum, and it was plainly avowed that the object of limiting the dividend on the new capital was to protect the interest of the old. As the proprietors consented to the course proposed, we have nothing to say against it.

We fear that some encouragement may be given to filibustering by the success of the Dartmoor and Exeter Water Company in extracting £2000 from the coffers of the Exeter Corporation. The Company have a name, and may, perhaps, have had a local habitation, but never had any works, and, probably, never would have had. It was the plan of a few schemers, who plotted against the old Exeter Water Company, from whom they possibly hoped to extort a considerable sum of money. As matters have turned out, however, perhaps some indignant ratepayer of Exeter may presently inquire for what the £2000 was paid by the Corporation. When that intelligent body purchased the undertaking of the old Company, they were perfectly free from all danger of competition, and the £2000 of the ratepayers' money was simply squandered.

The Corporation of Colchester appear to have a considerable quantity of land, which, in these days, is, of course, not very productive. Land at present pays about three per cent., while well-managed water undertakings may pay about five or six per cent.; so the Town Council of Colchester are seriously considering the advisability of disposing of their land, in order to buy up the water undertaking. Gas undertakings are still more profitable, if properly managed; and, if the money will run to it, there is a desire on the part of some of the Town Council to acquire the gas undertaking as well.

The Corporation of Bolton, not having been able to come to terms with the Corporation of Manchester, are determined on opposing the Thirlmere scheme of the latter. It seems that the works proposed by the Manchester Corporation will cross those of the Corporation of Bolton, who complain that the Bill laid before Parliament offers them no efficient protection. The great fight in Parliament will soon come off, and we shall speedily learn

the fate of the Thirlmere scheme. We need not repeat that we wish it success.

Wigan and other Corporations in the north agree with that of Manchester, who will go to Parliament with a very strong case. They have issued a statement in support of the second reading of the Bill, which must command attention. It is noteworthy that while the petition of what is called the Thirlmere Defence Association has received the signatures of only one hundred and twenty-two persons, and these mostly unconnected with the district, other petitions have been presented in favour of the Bill, signed by upwards of three thousand owners and occupiers in the neighbourhood.

Reading, like every other borough which has indulged in the luxury of sewage farming, loses money by the venture. It has, too, found it far from remunerative. A large debt has been incurred on account of two farms, and now more is wanted. In the meantime, rates have risen so prodigiously that people who went to the town some years ago in the hope of finding cheap homes are rapidly leaving the place.

It seems probable that the Scarborough Water Company will pass into the hands of the Scarborough Corporation, the Company making no objection.

### WATER BILLS FOR 1878.

The *Batley Corporation Water-Works Bill* proposes to raise £180,000 on mortgage of water-rates, borough-funds, and other rates, for the purpose of completing and extending the water undertaking authorized by the Act of 1871. The money is to be paid off by means of a sinking-fund, which is to be commenced after ten years from the passing of this Act.

The *Bedlingtonshire Local Board Water Bill* is to authorize the Local Board to acquire lands, and appropriate certain streams, which were not mentioned and described in the Provisional Order the Board obtained in 1875.

The *Bradford Water and Improvement Bill* is, among other things, to authorize the Corporation to raise £140,000 for the extension and the improvement of their water-works. For the rest, the Bill is to authorize recreation-grounds and street improvements, which it is calculated will add £445,000 to the debt of the Corporation.

The *Cardiff Water-Works Bill* is to empower the Cardiff Water Company to raise additional capital to the amount of £200,000, carrying the usual borrowing powers, for the purpose of extending the works, for the supply of a rapidly increasing district.

The *Cheltenham Corporation Water Bill* is a confiscatory measure aimed at the Cheltenham Water Company, which it proposes to authorize the Corporation to acquire on compulsion, by giving notice within three years of the passing of the Act. The terms of the purchase are to be settled by agreement or arbitration. The Corporation seek power to borrow £70,000 beyond what may be required for the purchase of the undertaking. What advantage the inhabitants of Cheltenham will derive by the transfer of the undertaking it is impossible to say. We may assume they would continue to drink the waters of the Severn contaminated by the sewage of several towns above them, and that they will not be the least the worse off for it. The water-rates would be none the lower, and what object is to be gained by the transfer we are at a loss to imagine. Water undertakings are rarely profitable in the hands of Local Authorities, and they ought not to be. Their management is invariably expensive, and ratepayers are not the least benefited when a change of possession is made.

The *Cheltenham Water-Works Bill* is promoted for the purpose of authorizing the Company to raise capital to the amount of £72,000, for maintaining a supply of water from the Severn in an extended district. Beyond this we see nothing novel in the provisions.

The *Cockermouth and Workington Water Bill* is promoted to enable the two Local Authorities to take a supply from Crummock Lake, in the West of Cumberland. So far as we know, no opposition is made to the appropriation of this lake, one of the most picturesque in the Lake district. No defence association has been formed, and no gushing middle-aged ladies or Cockney tourists have protested against the appropriation of the water of the lake for slaking the drought and washing the persons of the rather dusky population of Cockermouth. For the purposes of the Act the joint Boards seek power to borrow £26,500. The engineering works are, of course, extremely simple.

The *Dartmoor and Exeter Water Bill* is promoted by a clique whose object was to confiscate the undertaking of the present Water Company. The Bill is virtually abandoned, and, therefore, need not be noticed.

The *Deal Water Bill* is to authorize the Deal Water Company



to raise additional capital to the amount of £10,000, carrying the usual borrowing power to the extent of one-fourth.

The *Dore Water Bill* is to incorporate a Company for the supply of water to Dore and a surrounding district in the neighbourhood of Sheffield. A small catchment scheme seems to be proposed, which is to be supplemented by a supply from the Sheffield Water-Works Company. The rates are to be the same as those charged by the Sheffield Water Company. The proposed capital of the Dore Company is £10,000.

The *Dublin Corporation Water Bill* is to authorize the Dublin Corporation to construct additional water-works at an estimated outlay of £15,000.

The *Durham Water Bill* is to dissolve and re-incorporate the Durham Water-Works Company, who supply water to the city and environs of Durham from the river Wear and some wells in the neighbourhood. The original capital of the Company is to be £32,500, and this Bill seeks power to raise additional, to the amount of £32,500. Borrowing powers to the usual extent are asked on both old and new capital. The Bill is to confer all the customary powers of a Water Company. The ordinary rates and usual extras are allowed.

The *Exeter Water Bill* is to confirm an agreement entered into between the Exeter Water Company and the Corporation, to take over the works of the Exeter Water Company. After long squabbling, the Corporation agreed to the terms offered by the Company. The Corporation, we presume, will pay the expenses of the filibustering Company named above, and will go on supplying water from the same source as the Company obtained it. The terms of purchase have been commented upon in our columns, and need not be here repeated. The Corporation ask power to borrow £120,000.

The *Forfar Water Bill* is to enable the Commissioners of Police of Forfar to construct additional works for the better supply of Forfar and the adjacent district. For this purpose power is asked to borrow £50,000, to be repaid in the usual way.

The *Grand Junction Water-Works Bill* is to authorize the Company to raise additional capital to the amount of £300,000, with the usual borrowing powers.

The *Manchester Water Bill* is, of course, to authorize the Thirlmere scheme, about which nothing need be said here. The Bill seeks power to borrow £3,750,000, a sum greatly in excess of what was first thought would be required.

The *Mid-Cheshire Water Bill* is to incorporate a Company for the supply of water to a number of small towns and villages in the centre of Cheshire. The source of the water is to be a well in the new red sandstone. The authorized capital of the Company is £80,000, carrying the usual borrowing powers.

(To be continued.)

**KIRBYMOORSIDE GAS AND WATER COMPANY.**—The annual meeting was held on the 6th inst., when a dividend of 5 per cent. was declared. The *Leeds Mercury* states that for some years there has been in agitation a scheme for bringing a supply of pure water to the town of Kirbymoorside. The Local Government Authorities in London recently held a commission of inquiry as to the best source of supply, and from the report of their Inspector, advised the Local Authority on the spot to carry out a proposition from the Gas and Water Company, to bring a supply from Harland Moor; but, in consequence of the cost, the Local Board demur to this. The Shareholders decided to offer their plant to the Sanitary Authority, and thus let them have the opportunity of bringing the water at a less cost, if possible.

**ENNIS WATER-WORKS.**—No small amount of disappointment has been felt at the announcement of the receipt, by the Town Commissioners and Urban Sanitary Board of Ennis, of a communication from the Board of Works announcing that the calculations made did not show that the rating of the borough, which was offered as security for repayment of the grant of £12,000, asked as a loan for the construction of water-works, was such as to warrant a recommendation to Government to advance the sum required. So far this ends a vexed question which gave rise to much bickering between the Commissioners and the Ratepayers, it being contended that a majority of the latter were opposed to the scheme, owing to the large amount of taxation the project would entail. The river which surrounds Ennis is polluted by sewage and all sorts of impurities, and with the exception of three pumps in Ennis, from which the inhabitants at present obtain a supply, all the others, with the wells included, have been pronounced by Dr. Cameron, upon analysis, impure, unfit for use, and dangerous to health. Steps will be taken to have the matter speedily brought under the notice of Parliament.—*Freeman's Journal*.

**MEXBOROUGH WATER-WORKS COMPANY.**—At the first meeting of this Company, held on the 4th inst., it was stated that since the formation of the Company, in May, 1877, the works had been got into successful operation, and the demand for the Company's water had been better than expected. The amount expended on works up to the end of 1877 was about £3000, which included street-pipes to most of the principal streets in the town. The report of the Engineer and Manager, Mr. Tomlinson, stated that the works were in good condition, and had earned a dividend of 5 per cent. on the amount paid up to the end of the year 1877. The profit for part of the year 1877 would be carried forward to 1878 account. In answer to inquiries, the Engineer stated that the whole of the capital of the Company—£10,000—is subscribed for, and nearly one-half paid up. There is about £2000 still to spend, half of which will be for extension of works, and the other half for land, law, engineering expenses, &c., making the total outlay within the original estimate of £5000. The income of the Company in 1877 was sufficient to earn a profit of 5 per cent. on the capital paid up, and was progressing so favourably that a dividend of 10 per cent. may be confidently expected for 1878.

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### METROPOLIS WATER SUPPLY.

SIR,—The proposed action of the Metropolitan Board of Works in this matter cannot fail to be deeply interesting to the Water Consumers and Inhabitants of the Metropolis. The Board have introduced into Parliament two Bills, one to authorize them to purchase the undertakings of the Water Companies, and another to construct new works and bring in a supply of pure spring water for drinking, extinguishing fires, &c., and for that purpose to lay down a separate set of pipes throughout the Metropolis.

Neither of these Bills at present contains one word about rates, but rating powers will, of course, be given to the Board if they purchase the Water-Works Companies undertakings, and probably of the same compulsory character as those possessed by the Corporation of Manchester.

The important question to be first considered is whether it is better for the public that the water supply should be vested in a public body or in a trading company, and on this all-important point there is much to consider on both sides. The Board will say, "The health and cleanliness of the Metropolis is committed to our care, and as an abundant supply of pure and wholesome water is essential to this end, the water supply ought to be in our hands. You, the Water Companies, seek to make profits for your Shareholders; we, the Board, seek no profit, but will supply at cost price. It is therefore for the public advantage that the water supply should be vested in us." The Companies, on the other hand, will say, "Water supply is essentially a trading speculation, which may turn out a profit or a loss; you, the Board, have no right to spend public money in a trading speculation; we have incurred the risk; some of us have been many years without a dividend, and now that we have established useful and profitable undertakings, and supply the Metropolis abundantly with water which has been pronounced by Parliamentary Committees to be good and wholesome, you seek to deprive us of the fruit of our risk and labour, and compulsorily take away our property." The ratepayers will disregard all such disputes, and the question they have to decide is, "Shall we get a better, cheaper, and more abundant supply of water from the Board than from the Companies? If so, by all means let the Board have the works in their own hands. If we cannot clearly see our way to these advantages, then it is better to bear the ills we have than fly to others that we know not of."

Fortunately for the ratepayers, they can decide the question from results and recorded facts, which are better than any amount of speculative arguments. The experiment of entrusting public bodies with water supply has been tried in various cities and towns, such as Manchester, Liverpool, Leeds, Edinburgh, and several other large towns, and doubtless many of these cases will be cited as precedents in favour of the Board. From all that I can learn of these cases, I cannot fix upon one where the ratepayers have derived any real advantage from the change. But let us see from their own figures and statements what the Board propose to do in the Metropolis.

As to cost, the Board admit that their proposed second supply will cost about £5,500,000, and involve an increased expenditure of £225,000 a year. That, of course, means a dearer instead of a cheaper supply. But the Board propose to purchase the several undertakings of all the Metropolitan Water Companies, and thereby hope to effect some saving. This, however, is very doubtful; the shares of all the Companies are at a considerable premium, and a very much larger amount of capital will have to be raised for the purchase-money than the present nominal capital of the several Companies. Neither can the Board do with a much smaller working staff than at present employed by the Companies, and, with the want of experience of the Board in administering the water supply, any saving in interest on capital, expense of management, or otherwise, is an unknown quantity, and certain to be very much less than the proposed increase of £225,000 a year. The chief object of this additional expenditure is to provide a separate set of pipes throughout the Metropolis, with constant high pressure, for the extinguishment of fires (the further objects of supplying drinking and potable water to the houses will be afterwards considered). I learn from the evidence taken before the Committee of the House of Commons on the Metropolitan Fire Brigade, in 1876-7, that the total sum insured on Metropolitan property, in the several insurance offices, is £540,000,000; and, taking the premium at 2s. per £100 (which I believe to be a fair average), the total amount of annual premiums amounts to £540,000; so that the Metropolitan Board of Works propose to expend annually more than half the amount at present annually paid by the inhabitants of the Metropolis for insurance against fire. Surely this is an extravagant proposal! It is true that only about one-third of the whole metropolitan property is insured, according to the evidence given before the Fire Brigade Committee, but this fact only tends to show that under the present arrangements the chance of loss by fire is comparatively small; and, moreover, it is doubtful whether much greater security would be gained by the proposed arrangement, for we find that large fires do occur, even in cities and towns where the pressure is sufficient to throw a jet of water over the houses without the aid of a fire-engine. Then we may fairly doubt the figures of the estimate of five and a half millions. There are 1500 miles of streets in the Metropolis, and 419,374 inhabited houses; and, as we know from experience that few works are ever constructed at the estimated cost, the ratepayers must be prepared for a considerable expansion of the estimated annual increased cost of £225,000.

Let us see what advantages the ratepayers will derive from the inevitable additional rates which they will have to pay. It is proposed to furnish each house with a separate set of water-fittings, and to supply a small quantity of spring water, derived from wells in the chalk, for drinking and culinary purposes, but for all other purposes the present supply is to be continued without any alteration. The Board do not tell us how they can control the purposes for which the spring water shall be used. It is hard water, and for drinking is more pleasant than soft water, but for cooking and making tea it is not so good as the water



at present supplied. It has more carbonate of lime in it, and this makes a larger deposit on the utensils in which it is boiled, or if used to boil meat, it makes a large quantity of what the cooks call "scum." The only advantage, therefore, which the water consumers will gain for the largely increased rates is a small quantity of drinking water; for all other purposes the water now supplied is better.

But it will be said I have almost ignored the advantages in cases of fire. I do not deny that it would be an excellent thing to have mains always charged under high pressure for use at fires, but the question is whether it is worth the vast sum of money proposed to be spent upon a separate fire supply. At present the Companies supply water for fires free of cost. Fires will happen whatever remedies are provided; prudent people will insure, and it is not likely that the insurance offices will lower their rates if the proposed scheme be carried out; thus, any additional security for insured property will benefit the Insurance Companies.

I am inclined to think that the complaints against the London water supply strongly resemble Irish grievances which have passed away. No one can deny that formerly, when the supply was taken from the tidal portions of the Thames, the quality of the water was very objectionable, but that state of things has long since been remedied. Still the agitation against the London water supply has continued, and various parliamentary inquiries, for nearly thirty years past, have been made from time to time, where all parties have had ample opportunity of stating their views, and what are the results? In 1867 a Committee of the House of Commons, over which Mr. Ayrton presided, reported, after a long investigation: "We are satisfied that both the quality and quantity of water supplied from the Thames are so far satisfactory that there is no ground for disturbing the arrangements made under the Act of 1852, and that any attempt to do so would only end in entailing a waste of capital, and an unnecessary charge upon the Owners and Occupiers of property in the Metropolis."

In 1869 an extensive inquiry as to the London water supply was made by Royal Commissioners, of which the Duke of Richmond was Chairman, and they reported: "We are of opinion that there is no evidence to lead us to believe that the water now supplied by the Companies is not generally good and wholesome."

It is admitted that the water supplied from the Thames has greatly improved, and what little sewage passes into the river above the sources of supply is gradually being diverted; in fact, it is now illegal to run sewage into the Thames, under the Thames Navigation Acts of 1866 and 1867, and the Water Companies pay £7000 a year towards the expense of enforcing their provisions; but delays have occurred in some places, in consequence of alleged difficulties in providing other means of disposing of the sewage. I need say no more about the quality of the London water, because, whatever it be, the Board do not propose to improve it—they merely supply a small quantity of hard water for drinking purposes—as far as domestic supply is concerned. The Board seem at length to have awakened to a knowledge of the fact that the Thames is the natural water supply for London, and that, practically, there is no other source equal to the supply. They formerly made a great agitation about constant supply. The Companies said they would willingly give a constant supply if the public would find proper house-fittings to receive it, and the Board obtained parliamentary powers to enforce it; but they now say they shrink from the responsibility of compelling the ratepayers to expend the requisite money on fittings for a constant supply.

The cry of the Board is, "Something must be done." That is what the late Board of Health said in 1851, and their "something" was to bring soft water to London, and effect a saving to the inhabitants of soap and tea; and they devised the scheme of bringing soft water from Bagshot Sands, and they brought in a Bill for the compulsory amalgamation of all the London Water Companies, with a view to compel them to distribute this soft water. It was, however, proved before the Committee on that Bill that nothing like the requisite quantity of water could be obtained from these Sands (in fact, not half the quantity), that it was dangerous to pass it through leaden pipes, and that a large portion of it was contaminated with peat, loam, and oxide of iron. Yet the Board of Health believed in it, and, but for the investigations of other parties, would probably have persevered in the costly and useless experiment.

It remains only to consider the probable result of vesting the London water supply in the hands of the Board of Works. We have seen clearly that the cost to the ratepayers must be increased, and the only advantage a little drinking water. The Companies cannot spend too much money on improvements to please the ratepayers, because the Companies cannot exceed their parliamentary rates and dividends. The Board, on the other hand, cannot spend too little money to please the ratepayers, and will have compulsory powers of rating. In several towns supplied by Corporations, improvements in water supply have been delayed for years, by pledges extracted from candidates for municipal offices not to sanction the expenditure of money for improvements in the water supply. This happened especially at Liverpool and Worcester. London, fortunately as I think, has no municipal body; but, in the country towns, municipal business is often impeded by party politics, and these political disputes are often intruded into very unpolitical subjects. At Southampton a dispute arose about the source of the water supply—one source was called the Whig source, and another the Tory source, and in the meantime the works stood still. The Metropolitan Board are a changing body, with no pecuniary interest in the funds they administer, and, except the Chairman, without pay, and I do not believe that any such body of men, however honest and industrious, can do their work with the same thrifty economy and care as the Directors of a Company who have always a large pecuniary interest in the Company. I do not mean to say that there are not well-managed corporation water-works, but there have been many sad failures. Now, if the Companies fail, they suffer the loss; but, if the Corporations fail, the loss falls on the public. Edinburgh, Dundee, and Dunfermline each undertook the water supply by the Corporation. They each failed, and the supply in each case was handed over to a Company. The Corporation of Edinburgh have since bought up the Company, I believe, at a good premium. Manchester is supplied with both water and gas by the Corporation. The gas is made chiefly from

coal from Wigan, which is rather nearer to Manchester than Liverpool. The gas at Manchester is dearer than at Liverpool, though both are made chiefly from Wigan coal. Liverpool gas is supplied by a Company paying over 9 per cent. dividend. The explanation came out in 1851, in evidence taken before a Committee of the House of Commons, that, in order to make the water-rate at Manchester appear less, a large annual sum derived from the profits on gas was carried to the water account. This fact exposes another objection to water supply by public bodies, that of so manipulating the accounts and mixing up the rates as to mislead the public as to the real cost of the water supply. The advocates of municipal water supply were heard before the same Committee. I have carefully read the evidence, but do not find a single case in which it was attempted to be proved by figures that the ratepayers under municipal water supply had gained any advantage.

I have derived my facts from the various parliamentary reports and evidence on the Metropolis water supply, and I am forced to the conclusion that for many reasons it is not desirable to vest the water supply in the Metropolitan Board of Works. I think it is undesirable on behalf of the Board, as introducing an element of strife and contention, and imposing on them a troublesome duty, in which they have had no experience, and of too vast an extent to be satisfactorily performed, consistently with their other important duties. It is futile to point to Manchester, or any other city or town, as a precedent. London has no parallel in the world. It is not desirable on behalf of the public, and would certainly entail on them largely increased rates of a compulsory and arbitrary character in respect of all buildings, whether they used the water or not. It would place an immense revenue at the disposal of the Board of Works, and expose them to the temptation of trying expensive experiments, similar to the Bagshot Sands scheme of the late Board of Health.

I do not believe that the Board seriously think they can carry out the second supply scheme, about which they are nearly equally divided; and I think it may be safely assumed that if they purchase the undertakings of the Water Companies the water supply of London will continue the same as it now is, but with additional compulsory charges on the ratepayers.

Feb. 9, 1878.

H. W.

## Parliamentary Intelligence.

### HOUSE OF LORDS.

MONDAY, FEB. 4.

The Examiners reported that the Standing Orders applicable to the West Houghton Local Board Bill have been complied with; that the further Standing Orders applicable to the Imperial Continental Gas Association Bill have been complied with; and that the further Standing Orders applicable to the South Staffordshire Water Bill have not been complied with.

Bills read the first time:—Bedlington Local Board (Water); Castleford Local Board; Mansfield Commissioners Gas.

Bills read a second time:—Clitheroe Gas, Water, and Improvement; Dublin Corporation Water - Works Acts Amendment; Forfar Water; Sutton-in-Ashfield Gas.

A petition against the Newry Gas Bill was presented from the Newry Gas Consumers Company.

TUESDAY, FEB. 5.

The Examiners reported that the Standing Orders applicable to the Waterford Corporation Water and Improvement Bill have been complied with; and that the further Standing Orders applicable to the Castleford and Whitwood Gas, Exeter Gas, and Warrington Water Bills have been complied with.

Bills read a second time:—Exeter Corporation Water; Leicester Corporation.

THURSDAY, FEB. 7.

The Examiners reported that the Standing Orders applicable to the Drumcondra, Clonliffe, and Glasnevin Township Bill have been complied with; and that the further Standing Orders applicable to the Normanton Gas Bill have been complied with.

Bills read a second time:—Imperial Continental Gas Association; Newry Gas.

Petitions were presented against the following Bills:—Batley Corporation Water, from Corporation of Dewsbury and Heckmondwike Local Board; Castleford and Whitwood Gas, from Charles Wheler Wheler; Castleford Local Board, from Castleford and Whitwood Gaslight and Coke Company, Limited; Clitheroe Gas, Water, and Improvement, from Lancashire and Yorkshire Railway Company; Normanton Gas, from Castleford and Whitwood Gaslight and Coke Company, Limited.

FRIDAY, FEB. 8.

The following reports from the Standing Orders Committee were agreed to:—"That the Standing Orders not complied with in respect of the South Staffordshire Water Bill ought to be dispensed with, and the Bill allowed to proceed, provided that proof be given before the Examiners that the Bill has been approved of at a meeting of the Company called and held in accordance with Standing Order No. 62." "That in respect of the Nottingham Improvement, Gas, and Water Bill the Standing Order not complied with in respect of clause 7 may be dispensed with, the only person interested therein having consented thereto; and the Standing Order not complied with in respect to clause 33 may also be dispensed with, provision being made in the Bill for the protection of the domestic supply of water within the limits of the borough." "That the Standing Orders not complied with in respect of the Cheltenham Corporation Water Bill ought to be dispensed with."

Bills read a second time:—Castleford and Whitwood Gas; Exeter Gas; Warrington Water.

Petitions against the following Bills were presented:—Batley Corporation Water, from (1) London and North-Western Railway Company, (2) Walter Thomas William Spencer Stanhope, (3) Edmund Barber; Castleford and Whitwood Gas, from Castleford Local Board; York United Gas, from Bulmer East Highway Board.

### HOUSE OF COMMONS.

MONDAY, FEB. 4.

METROPOLIS WATER-WORKS (PURCHASE) BILL.—The Examiners reported that the Standing Orders have been complied with in the case of this Bill.

The Examiners reported that Standing Order 62 has been complied with in the case of the Grand Junction Water Bill; and that Standing Order 63 has been complied with in the case of the Durham Water Bill.



The petition was presented for the Torquay Gas Bill, which was ordered to be brought in by Sir John Kennaway and Mr. Rodwell.

The Nottingham Improvement, Gas, and Water Bill was ordered to be brought in by Mr. W. E. Denison and Mr. Isaac.

Bills read the first time, and ordered for second reading:—Cheltenham Corporation Water; Dore Water; Maryport Improvement; Scarborough Corporation Water.

Bills read a second time and committed:—Bradford Water and Improvement; Brading Harbour District Gas; Cheltenham Water; Nottingham Water.

Petitions against the following Bills were presented:—Bangor Local Board, from London and North-Western Railway Company; Cheltenham Water, from (1) Midland Railway Company, (2) Corporation of Cheltenham; Cleveland Gas, from Thomas Garbutt and others; Cockermouth and Workington Water, from (1) Trustees under the will of William Marshall, deceased, (2) London and North-Western Railway Company; Durham Water, from North-Eastern Railway Company; Farnworth and Kearsley Gas, from Moses Gate and Ringley Branch Turnpike Road Trustees; Grand Junction Water, from Metropolitan Board of Works; Manchester Corporation Water, from (1) Corporation of Liverpool, (2) Lord Egerton of Tatton; Marske and Saltburn Gas, from (1) Cleveland Gas Company, (2\*) Owners, &c., in or near Saltburn-by-the-Sea; Metropolis Water Supply, from (1) Earl of Egmont, (2) Epsom Local Board of Health, (3) Great Western Railway Company, (4) Great Eastern Railway Company, (5) Midland Railway Company, (6) South-Eastern Railway Company, (7) Conservators of the River Thames, (8) South Essex Water-Works Company, (9) London, Chatham, and Dover Railway Company, (10) London and North-Western Railway Company, (11) Vestry of St. Pancras, Middlesex, (12) London, Brighton, and South-Coast Railway Company; Nottingham Water, from Hucknall Torkard Local Board; Radcliffe and Pilkington Gas, from Governors of the Bolton Free Grammar School; Shrewsbury Gas, from (1) Great Western Railway Company, (2) London and North-Western Railway Company.

#### TUESDAY, FEB. 5.

The petition was presented for the West Houghton Local Board Bill, which was ordered to be brought in by Mr. Hardcastle and Mr. Hick.

The Examiners reported that Standing Order 62 has been complied with in the case of the Bangor Water and Gas, Hartlepool Gas and Water, and Scarborough Water Bills; and that Standing Order 63 has been complied with in the case of the Sevenoaks Water, and Tredegar Water and Gas Bills.

Bill read the first time, and ordered for second reading:—Nottingham Improvement, Gas, and Water.

Bill read the first time, and referred to the Examiners:—Torquay Gas.

Bill read a second time, and committed:—Hamilton Burgh.

Petitions were presented against the following Bills:—Bradford Water and Improvement, from Oxenhope Local Board; Cheltenham Corporation Water, from Ecclesiastical Commissioners for England; Cleveland Gas, from (1) North-Eastern Railway Company, (2) Consumers of gas and others in Marske and Saltburn; East Retford Borough, from (1) Great Northern Railway Company, (2) Manchester, Sheffield, and Lincolnshire Railway Company; Manchester Corporation Water, from Corporation of Blackburn; Metropolis Water Supply, from (1) Lambeth Water-Works Company, (2) Joint Lessees of North and South Western Junction Railway, (3) Commissioners of Sewers for the Levels of Havering, Dagenham, &c., (4) Willesden Local Board, (5) Edgware Highway Board, (6) Kent Water-Works Company, (7) Chelsea Water-Works Company, (8) Sutton District Water Company, (9) Grand Junction Canal Company, (10) Corporation of the City of London, (11) Grand Junction Water-Works Company, (12) East London Water-Works Company, (13) Surveyors of Highways for Norwood, Middlesex, (14) Bromley Local Board, (15) Millowners and others on or near the Rivers Ravensbourne, &c., (16) Millowners and others on or near the River Colne, (17) Millowners and others on or near the Rivers Hogg's Mill, &c., (18) Her Majesty's Commissioners of Sewers for Rainham to Mucking Levels, (19) West Middlesex Water-Works Company, (20) New River Water-Works Company, (21) Southwark and Vauxhall Water Company, (22) Justices of the Peace for Middlesex, (23) Regent's Canal Company, (24) Poplar District Board of Works, (25) Eliza Macfarlane Begg, (26) Lea Conservancy Board; Radcliffe and Pilkington Gas, from (1) Little Lever Local Board, (2) Whitefield Local Board, (3) Prestwich Local Board, (4) Radcliffe Local Board; Scarborough Water, from (1) Sir Harcourt Johnstone, Bart., (2) North-Eastern Railway Company.

#### WEDNESDAY, FEB. 6.

Bills read a second time and committed:—Cardiff Water; Newbury Borough Extension; Stoke-upon-Trent Corporation Gas.

Petitions were presented against the Bournemouth Gas and Water Bill, from Bournemouth Commissioners; and against the Manchester Corporation Water Bill, from Mary Countess Ossalinsky, and (the petitioners not praying to be heard) Hogarth John Swale and others.

#### THURSDAY, FEB. 7.

The Examiners reported that Standing Order 62 has been complied with in the case of the South Hants Water Bill; and that Standing Order 63 has been complied with in the case of the Lewes Gas Bill.

Bill read the first time, and ordered for second reading:—West Houghton Local Board.

Petitions against the following Bills were presented:—Bradford Water and Improvement, from (1) Millowners, &c., on River Worth, (2) Great Northern Railway Company; Brading Harbour District Gas, from Sandown Local Board; Cardiff Water, from (1) William Steward Cartwright, (2) Owners of the Heath Estate, (3) Marquis of Bute and his trustees, (4) Inhabitants of Glamorganshire; Manchester Corporation Water, from James Omrod, William Gray, and William Hargreaves; Metropolis Water Supply, from Vestry of Mile End Old Town; Nottingham Improvement, Gas, and Water, from Great Northern Railway Company; South Hants Water, from South Stoneham Rural Sanitary Authority.

Petitions against the Manchester Corporation Water Bill (the petitioners not praying to be heard) were presented from—(1) Prescott Hewett and others, (2) Owners, lessees, and occupiers in the Lake District of Lancaster, Rev. H. D. Rawnsley and others, (3) Owners, &c., in the county of Westmoreland, Thomas Mason and others, (4) Owners, &c., in the county of Westmoreland, S. P. Bouffeurs and others, (5) Owners, &c., in the county of Westmoreland, S. Cooper and others, (6) Owners, &c., in the county of Westmoreland, Henry Ware, (7) Owners, &c., in the county of Cumberland, J. J. Spedding and others, (8) Owners, &c., in the county of Cumberland, Mary Stamper and others, (9) Members of the University of Oxford, (10) Members and Associates of the Royal Academy of Arts, (11) Members and Associates of the Society of Painters in Water Colours, (12) Bishop of St. Andrew's and Principal of St. Andrew's University and others, (13) John Richard Green and others, (14) James E. Backhouse and others, (15) Thomas Carlyle and others, (16) Residents in Manchester and

\* This petition is also in favour of the Cleveland Gas Bill.

suburbs, (17) Residents in York and elsewhere, (18) Residents in Leeds and elsewhere, (19) Residents in Liverpool and elsewhere, (20) Residents in Sheffield and elsewhere, (21) Residents in Huddersfield and elsewhere, (22) Residents in Huddersfield, Sheffield, and elsewhere, (23) Residents in Newcastle-on-Tyne and elsewhere, (24) Residents in Bury, Lancashire, and elsewhere, (25) Residents in Birmingham and elsewhere, (26) Residents in Scarborough and elsewhere, (27) Residents in Ambleside and elsewhere, (28) Residents in Keswick and elsewhere, (29) Residents in Warrington and elsewhere, (30) Residents in Bristol, Bath, and elsewhere, (31) Residents in Berkshire and elsewhere, (32) Residents in Cheltenham and elsewhere, (33) Residents in Hampshire and elsewhere, (34) Residents in Hastings and elsewhere, (35) Residents in Norwich and elsewhere, (36) Residents in Somersetshire and elsewhere, (37) Residents in Leicester and elsewhere.

#### FRIDAY, FEB. 8.

The petition was presented for the Drumcondra, Clonliffe, and Glasnevin Township Bill, which was ordered to be brought in by Mr. Ion Trant Hamilton, Mr. Sullivan, and Mr. Dalway.

The Examiners report, "That Standing Order 62 has not been complied with in the case of the Limerick Corporation Gas Bill," was referred to the Select Committee on Standing Orders.

Bill read a second time and committed:—Dalton-in-Furness Local Board.

Petitions against the following Bills were presented:—Bradford Water and Improvement, from (1) Heaton Local Board, (2) Eccleshill Local Board, (3) Hunsworth Local Board, (4) North Bierley Local Board, (5) Clayton Local Board, (6) Windhill Local Board, (7) Cleckheaton Local Board, (8) Birstal Local Board, (9) Calverley District Water-Works Company, Limited, (10) Midland Railway Company, (11) Matthew Todd, (12) Leeds and Liverpool Canal Company; Brading Harbour District Gas, from (1) Sandown Gas and Coke Company, Limited, (2) Shanklin Gas Company, Limited, (3) Shanklin Local Board; Cardiff Water, from (1) Corporation of Cardiff, (2) Great Western Railway Company; Hemel Hempstead District Gas, from Hemel Hempstead Highway Board; Lee Bridge District Gas, from Walthamstow Local Board; Manchester Corporation Water, from (1) Corporation of Oldham, (2) Earl of Lonsdale and others, (3) Corporation of Preston, (4) Stanley Hughes le Fleming, (5) Midland Railway Company, (6) Ratepayers of Manchester, (7) Charles Joseph Stonor; West Houghton Local Board, from (1) Duke of Bridgewater's Trustees, (2) Justices of the Peace for the county palatine of Lancaster, (3) Lancashire and Yorkshire Railway Company.

#### SATURDAY, FEB. 9.

A petition in favour of the Cheltenham Water Bill was presented from Tewkesbury Rural Sanitary Authority.

Petitions against the following Bills were presented:—Bangor Local Board, from Lord Penrhyn (against alterations); Bangor Water and Gas, from (1) Bangor Local Board, (2) Lord Penrhyn (against alterations); Brading Harbour District Gas, from Inhabitants, Owners of property, and Ratepayers of Brading; Cheltenham Corporation Water, from the Great Western Railway Company; Dalton-in-Furness Local Board, from Furness Railway Company; Hemel Hempstead District Gas, from Grand Junction Canal Company; Lee Bridge District Gas, from Leyton Local Board and Consumers of Gas; Manchester Corporation Water, from (1) Charles Johnson, (2) Corporation of Bolton, (3) Andrew Knowles and Sons, Limited, (4) William Ford Hulton, (5) Leonard Stanger Leathes, (6) London and North-Western Railway Company, (7) Owners, &c., of land, and persons interested in streams, (8) Justices of the Peace for the county palatine of Lancaster, (9) Duke of Bridgewater and Earl of Ellesmere's Trustees, (10) Sir Charles Henry Tempest, Bart., (11) Edward Petre, (12) Fylde Water-Works Company, (13) Colliery Proprietors, and South Lancashire and Cheshire Coal Association, (14) Leeds and Liverpool Canal Company.

### Legal Intelligence.

#### HOUSE OF LORDS.—TUESDAY, FEB. 5.

(Before the LORD CHANCELLOR, Lord HATHERLEY, Lord BLACKBURN, and Lord GORDON.)

#### HOPE v. THE LOCAL BOARD OF HEALTH OF ROMFORD.

This was a question as to the legal construction of an agreement for the disposal of the sewage of Romford, which agreement the plaintiff said he was induced to sign under what he considered false misrepresentations as to the number of houses connected with the existing sewers, and as to the amount of sewage available to be pumped on the farm of which he was tenant. In the Court below, judgment had been given against the plaintiff.

On the appeal, the plaintiff appeared in person. Counsel for the Romford Board of Health were not called upon.

Their Lordships held there had been no false or deceitful misrepresentations made by the Board which induced Mr. Hope to enter into the lease, and that the appeal must be dismissed with costs.

### Miscellaneous News.

#### METROPOLIS GAS SUPPLY.

CHELSEA VESTRY.—At the Meeting of this Vestry on Tuesday, the 5th inst., Mr. Tully, inspector of mains to the London Gaslight Company, attended, and asked the Vestry to rescind a former resolution, passed on the recommendation of the Surveyor, prohibiting the laying of gas-mains under the footway in Pont Street, Chelsea. Mr. Lawrence said there was great danger from having pipes too near vaults, and he moved that the Vestry refuse to sanction any such arrangement. Mr. Forth seconded the motion. Mr. Cuthbertson considered that the Gas Company had a very good case. It was exceedingly inconvenient for shopkeepers to have the roads constantly taken up, and even if it were true that gas escaped from the main-pipes, the danger was but little removed by having them in the road. The motion was agreed to *nem. dis.*, and it was further resolved that the Surveyor should serve a written protest on the Gas Company, when, in his opinion, the pipes were not laid sufficiently deep.

Dr. Stevenson's report on the gas supplied by The Gaslight and Coke Company to the Vestry of St. Pancras, during the month of January, 1878:—Maximum light, estimated by sperm candles, according to the Act—18.8. Minimum light, sperm candles—16.7. Average light, sperm candles—17.6. Traces of ammonia, indicated by turmeric test paper—Traces on all occasions. Traces of sulphuretted hydrogen, indicated by lead test paper—None on any occasion. Sulphur 12.16 grains per 100 cubic feet of gas.



## METROPOLIS WATER SUPPLY.

## METROPOLITAN BOARD OF WORKS.

At the Weekly Meeting on Friday last—Sir J. Hogg, M.P., in the chair—a deputation of inhabitants of the Borough of Southwark attended to present a memorial on the subject of provision being made in the Board's Water Supply Bills now before Parliament for a proper mode of charge to the consumers. The memorialists stated that they and their neighbours had for many years paid to the Southwark and Vauxhall Water Company fair and sufficient water-rates, fully amounting to, and in some cases in excess of, those charged by other Water Companies. The Company had suddenly, and without notice, charged an increased rate of from 50 to 400 per cent.—the average increase on 78 houses, taken from High Street, Southwark, and streets leading therefrom, being 125 per cent. It was contended that if the old rate was sufficient for some years to pay the Shareholders a good dividend, and, if the Company or their officers had by mismanagement or otherwise diminished the income or increased the expenses of the Company, the loss ought not to fall on the consumers. Especial attention was called to the basis of the charge for water-rates by the Southwark and Vauxhall Company—viz., the "annual value"—as being to persons using houses for business purposes, at high rents, an unfair and unreasonable method of fixing such rates. The memorialists were of opinion that the difficulty might be met if, in places of business, water were supplied by meter, with a minimum charge—say, 2 per cent.—on the annual value. As an alternative remedy, they suggested that where domestic and business requirements existed under the same roof, a separate valuation and ratable should be made in respect of each; or a plan simpler still would be to supply all houses by meter at a fixed price per 1000 gallons, the rate per 1000 gallons decreasing in proportion to the extent of the consumption. It was also asserted that the general irregularity of the water-rat throughout the Metropolis demanded adjustment, inasmuch as there was no adequate reason why in some districts the charge should be 4 or 5 per cent., whilst in others it was only 1 per cent. on the value.

Mr. GAINSFORD, of the firm of Goode and Gainsford, addressed the Board, and stated that one reason why the deputation had been appointed was the belief that prevailed that the recent increase in the assessments had been brought about by the change proposed by the Board in respect of the water supply of the Metropolis, and they, therefore, pressed the matter upon the consideration of the Board, on the ground that whatever arrangement might be come to for the purchase of the Companies, the ratepayers, not only of Southwark, but of the whole Metropolis, would be made the victims of this new increased ratable.

In answer to Mr. H. L. TAYLOR, it was stated by Mr. GAINSFORD that the new precepts of the Company were issued in September last; that there had been no general re-assessment of the district, but that the additional rates had been imposed on individual houses at will. A deputation of 12 of the principal inhabitants had waited upon the Company, but the Directors declined to deal with them.

Mr. RICHARDSON, addressing the deputation said: You understand that if we purchase these Companies we have to purchase their rentals.

Mr. ROCHE objected to the statement, which he said was not a proper one to be made publicly.

Mr. DALTON asked whether the deputation represented the Vestry.

Mr. GAINSFORD said they did not; they merely represented the trading community.

On the motion of Mr. Pocock, the memorial was referred to the Parliamentary Committee.

Communications from the Vestries of Rotherhithe and St. Olave's District Board, approving the Water Bills of the Board, were presented, and a letter in opposition to them was read from the Vestry of St. George-the-Martyr.

The Works and General Purposes Committee made a report stating that they had considered the notice from the New River Company of their intention to provide a constant supply of water in the Parish of Shoreditch, from Dec. 10, 1877, and the letter from the Company, requesting the Board to specify at what places, and of what dimensions and form they require the Company to provide hydrants in the parish, in order to give the public the full benefit of constant supply; and recommending that the Company be required to provide 12 hydrants at the points marked on a plan submitted with the report. They also recommended that, with reference to the notice from the East London Water Company, under the 34th section of the Metropolis Water Act, 1871, that a constant supply of water is now given within a certain district of their water limits, the Company be required to provide 12 hydrants at the points marked on a plan submitted with the report, and also that with reference to a similar notice from the Kent Water-Works Company, they be required to provide 12 hydrants at the points marked on a plan submitted with the report.

## MEETING OF DELEGATES.

The Delegates from the Vestries and District Boards of the Metropolis, whose meeting on the 28th ult. was adjourned, in order to allow sufficient time for their constituents to consider the resolution then proposed, reassembled on Friday last, at the Offices of the National Chamber of Trade, to take into consideration the water schemes of the Metropolitan Board of Works.

Mr. R. ATTENBOROUGH, Chairman of the Executive London Water Supply Committee, presided, and, in opening the proceedings, stated that since the last meeting the matter had made considerable progress, and he scarcely knew whether they were then in time to exercise the influence on the Metropolitan Board that they intended. He was sorry to say that the Bill for scheme No. 2—for a duplicate system of supply, to which, he believed, 19 out of 20 of the ratepayers objected—had passed its second reading, and he imagined that they were out of court, so to speak, as to any opposition to that Bill in the House of Commons. He was informed by a member of the Board of Works belonging to the St. James's Vestry, that it was not the intention of the Board to proceed with the Bill irrespective of the other relating to the purchase of the Companies; but it appeared to him that they pressed on with it in undue haste, preventing the ratepayers having an opportunity of expressing their opinion. Of course, they were aware that this proposal of the second scheme had come upon the ratepayers since they had the opportunity of returning members to the Vestries or the Metropolitan Board of Works, and, consequently, the opinions of the ratepayers were not known at all on the second scheme. As regards the purchasing of the Water Companies interests, it was generally pretty well known what the feelings of the ratepayers were, and there was no doubt about the benefit of the supply of water to the inhabitants of the Metropolis being in the hands of a public body, devoted to the interests of the consumers, rather than in the hands of a variety of bodies having only a personal money interest. There might be doubts as to whether the purchase would not entail greater burdens on the ratepayers, but that was a matter of detail. How they could get the proposal carried out with advantage to the ratepayers was a subject on which they had to deliberate. A petition to the House of Commons had been drafted with reference to the matter, and would be submitted. With reference to the second Bill, they were too

late to petition, but they might have an interview with the Parliamentary Committee of the Metropolitan Board. The first business before the meeting was a resolution to be adopted in regard to the proposal to purchase the Companies, and was as follows:—"That in the opinion of this meeting it will be to the interest of the ratepayers and the consumers that the undertakings of the several Water Companies should become the property of the Metropolitan Board of Works; but a limit, or the means of arriving at a limit, for the sum or sums to be paid for such purchase must be defined by the Metropolis Water-Works Purchase Bill, and a petition embodying this resolution be presented to Parliament."

The SECRETARY (Mr. Morrison) having read the petition referred to in and embodying the resolution, it was formally moved and seconded by the representatives of Kensington and St. James's, Westminster, respectively.

Mr. FOWLER (Lambeth) whilst approving of the principle that the water supply should be in the hands of the Municipal Authority, pointed out that the Bill of the Metropolitan Board would require considerable modification, and amongst other matters to which he directed particular attention, were the obligations entered into by the Water Companies in order to obtain their present privileges—obligations which he thought had not been carried out. The Companies were to give a pure supply of water, to get filter-beds and impounding reservoirs, and generally to improve their supply. For this Parliament gave certain privileges, which built up the large dividends that were paid. If the Companies had not been able to do that which Parliament imposed, the fact should be taken into consideration.

Mr. ROBINS (St. George-the-Martyr) moved, as an amendment—"That, in the opinion of this meeting, it will be opposed to the interests of the ratepayers of the Metropolis that the undertakings of the Water Companies become the property of the Metropolitan Board of Works." He said the Metropolitan Board had broken faith with the ratepayers on other questions, and had plenty to attend to at present. He was of opinion that the Board were, therefore, the wrong parties to be entrusted with this duty, and that the present supply of water was sufficient, and might be obtained pure if the Acts of Parliament were put into operation.

Mr. REED seconded the amendment, on the ground that the proposal was inexpedient and injudicious. The tendency towards centralization had reached a point at which it was becoming dangerous. The Metropolitan Board were not the body to undertake such a charge, and the way they dealt with other duties cast upon them, notably the Thames floods prevention, was not such as to induce confidence in them.

Mr. BONTHEON supported the resolution. By waiting, more would have to be paid for the purchase of the Companies.

Mr. COX (Lambeth) supported the amendment. He thought the Metropolitan Board had enough to do at present with artisans dwellings and other things.

After some further remarks, a division of the Vestries was taken, when it appeared that all represented were in favour of the resolution, except Lambeth and St. George-the-Martyr, and the representatives of Lambeth present were divided in opinion—four against and one for—and were not delegated by their Vestry to express the opinion of that body.

The CHAIRMAN announced that the Wandsworth Board had written, giving their approval to the resolution, and the Holborn Board declined to co-operate. The St. Pancras Vestry had taken action for themselves.

The resolution was accordingly declared carried.

The CHAIRMAN stated that, with regard to the second scheme of the Metropolitan Board, it was difficult to say what action should be taken. It would be a bad thing for the ratepayers if it were carried, entailing an expenditure of from six to eight millions, and involving the breaking up of all the streets for a scheme which might be utterly futile.

Mr. LIGGINS (Kensington) moved a resolution to the effect that the strongest opposition be offered to the Bill, and steps be taken to defeat it.

Mr. WHITE (Lambeth) seconded the resolution. He said on that scheme they were unanimous. The scheme was totally uncalled for, and was only carried at the Board of Works by a majority of five.

Several representatives present said their Vestries were unanimous in opposing the scheme, and the resolution was passed *nem. con.*

Afterwards a deputation was appointed to wait on the Parliamentary Committee of the Metropolitan Board to present the resolution in regard to the second scheme, and, if the interview were unsatisfactory, to call another meeting of the delegates with the view of waiting on the Home Secretary.

The proceedings closed with a vote of thanks to the Chairman.

## OPPOSITION TO THE METROPOLITAN BOARD WATER SUPPLY BILL.

On Monday, the 4th inst., an influential meeting of the Millowners, Landowners, &c., in the districts around the Metropolis, was held at the City Terminus Hotel, Cannon Street, to consider the Bill of the Metropolitan Board for obtaining a supplemental supply of water for London by sinking wells in the chalk, and determine whether any or what steps shall be taken by them to oppose the Bill, with a view to protect their properties and interests. Mr. JOHN EVANS, F.R.S., of the firm of Messrs. Dickinson and Co., paper manufacturers, of Hemel Hempstead, presided; and there were present many riparian owners of the Wandle and Mole, in Surrey; the Ravensbourne, the Darent, and the Dart, in Kent; the Rother and Lea, in Essex; the Colne, in Middlesex; and other interests were also represented.

The CHAIRMAN, in his opening address, said they had met, and many of them not for the first time, to devise means for the protection of rights now in their possession, affecting mills, lands, and property in general. On some former occasions they had had opposed to them small, incipient Companies; but in this issue they had a very different power to contend against—viz., the Metropolitan Board of Works, who were about to bring into Parliament two schemes for altering the water supply of the Metropolis. That body proposed to pump up from the chalk sufficient water for drinking and cooking purposes, and, by means of hydrants, at the same time supply enough for the extinction of fires—both supplies to be constant. The second proposal was to purchase the interests of the existing Water Companies. With the latter project the meeting had nothing whatever to do. But with regard to the other scheme, on which it was intended to spend a sum of £5,000,000 sterling, they had a great deal to say. The whole of the water to be taken was to be derived from new sources, and it was to be procured from districts where there was actually none to spare, not from the surface, but from underneath. From experiments he had made, he found that rain water—and most of the water they obtained was nothing else—did not percolate more than about three feet into chalk, and all who lived in a chalk country were pretty well aware of that. It was said that 16 million gallons of water would be required to be drawn per diem by the scheme of the Metropolitan Board, and, to give that amount, no less than 100 square miles of chalk country would be required. In fact, the whole quantity of water in the chalk must be drawn off. It was intended to have six pumping-stations, at Denham, Hayes, Keston, Epsom, &c., where the water would be drained away from the streams; and by having deep wells, those belonging to private owners would be emptied. The mischief would not be confined to those places mentioned by the Board, because,



if any difficulty arose in getting the required quantity of water, there would be no hesitation about going into other chalk districts to make it up. The Board would practically be establishing a system of freebooting, constituting it right at any time for large towns to go into country places and draw off all the water to be found, without any compensation whatever for the injury inflicted. Take it that 16 million gallons per day would be wanted for these two supplies, the question arose whether the present Companies could or could not give it. He unhesitatingly said they could, and the scheme for interfering with the water in other directions was, therefore, unnecessary and unwarrantable. The Kent Company, for instance, the water supplied by them being set down as pure, could give 9,000,000 gallons daily from the chalk; whilst the New River Company were in a position to afford, with their four chalk wells in full operation, 8,900,000 gallons, making together a total of 17,900,000 gallons, or nearly two million gallons more than the maximum quantity fixed by the Metropolitan Board of Works. As to the purity of water, he would just mention that Dr. Frankland reported that in some supplied from chalk wells there was more sewage contamination than in the Thames water as now supplied to houses, a fact due to the natural infiltration constantly going on from that river. After compelling many parties to go to an immense expense in drainage works, to ensure the purity of the Thames, the Metropolitan Board turned round and said they could not use its water, but must lay out an enormous sum to obtain that commodity from the chalk districts. In conclusion, he designated the Bill as framed in such a manner that it would, if passed into law, confer a power to make raids on private property both unconstitutional and unjust. He was heartily glad to see that so many, deeply interested as they were with himself as well as some of the London Vestries, had come forward to express their strong dissent to the Bill, and were determined to oppose it to their utmost, as one of the most reckless attempts to waste public money ever devised.

Mr. W. FOWLER moved the first resolution. In doing so, he said, as he understood, they had been called together to protest against the water, which was so valuable to them, being taken away unless ample compensation was given in return. As a trustee to property affected, he thoroughly dissented from the Bill, and moved—"That the whole of the water proposed to be pumped from the wells to be sunk under the authority of the Metropolitan Water Supply Bill will be abstracted from the springs, feeders, and waters of the chalk district around London, to which the Metropolitan Board of Works have no right whatever."

Mr. PODGER seconded the motion, which was supported by Mr. SPENCER, and adopted unanimously.

Mr. A. G. HOPE moved, and Mr. H. MERCER seconded, the following resolution, which was also unanimously adopted:—"That the proposed fresh sources of supply are needless, inasmuch as the existing Water Companies, whose properties the Metropolitan Board of Works purpose to acquire under another Bill, are capable of supplying an equal quantity of water derived from the chalk, and of the purity and quality required."

Mr. WARD moved the next resolution, which, seconded by Mr. HENDERSON, and adopted, was as follows:—"That though in the proposed Bill the sinking of wells is limited to certain parishes in the counties of Bucks, Middlesex, Surrey, Kent, and Essex, there can be little doubt that should the supply prove insufficient, a similar attack on the rights of property will be made in other places around the Metropolis."

Rev. J. C. CLUTTERBUCK moved—"That the operations of the Metropolitan Board of Works would inflict immense injury on the owners and occupiers of land, and proprietors of wells, in the neighbourhood of the spots where the new wells are to be sunk, as well as on the owners and occupiers of mills along the course of the streams from the sources and waters of which 16 million gallons daily are to be abstracted." He said he recollected a company being formed in the year 1840, to which the late Mr. Robert Stephenson was Consulting Engineer, the object being to draw 8 million gallons of water per day from a chalk district, but it was found impracticable, and abandoned. Many people still believe that Liverpool had an abundance of water, and that it was easy to get it from the red sandstone. That, however, had proved a delusion, and he ventured to predict the same result if the experiment was now made with chalk. Besides, it was their duty to resist anything which tended to depreciate the importance of their water power, which would yet be found to be most useful and necessary in the country.

Mr. IBBOTSON seconded the motion, which was carried unanimously.

Baron DIMSDALE said that the meeting had nothing to do with the scheme for purchasing the existing Water Companies, although he, for one, was opposed to it. What they had to look to was the scheme to abstract the water from the chalk for many miles round London, and he believed the House of Commons would not let the interests of a large class of the community suffer in the direction proposed, and suffer, as the Chairman had explained, most needlessly. He moved the last resolution, as follows:—"That an Association be formed for the purpose of opposing the Metropolitan Water Supply Bill about to be brought into Parliament by the Metropolitan Board of Works, and that a Committee be appointed to arrange and receive subscriptions, and conduct and manage the opposition to the Bill."

Mr. MERCER seconded the motion, which was adopted, and a Committee were formed, with power to add to their number.

A petition to Parliament, in opposition to the Metropolitan Water Supply Bill, was handed round for signature, and a vote of thanks having been passed to the Chairman, the meeting broke up.

**VESTRY OF ST. PANCRAS.**—The Clerk to this Vestry has issued the following letter addressed to the various Vestries and District Boards:—

Vestry Hall, Pancras Road, Feb. 2, 1878.

Metropolis Water Supply Bills.

Dear Sir,—As you are aware from my previous circulars, the Vestry of this parish have determined to oppose the scheme of the Metropolitan Board of Works with reference to the Water Supply of the Metropolis, and a petition (a copy of which was sent to you on the 19th ult.) has been presented to Parliament against the Board's proposals.

The Committee of this Vestry, who are conducting the opposition, without wishing to dictate in any way to your Board, whether in favour of, or against the Water Supply Scheme, are very desirous to draw attention to a most important point which not only affects this question, but every measure to be hereafter promoted by the Metropolitan Board of Works, as controlling the rights and privileges of Vestries and District Boards.

Two Bills are being promoted by the Metropolitan Board. Neither of these is promoted with the unanimous approval of the Board, and one of them by only a small majority. The Vestry of this parish having determined to oppose, petitioned Parliament accordingly, praying to be allowed to state their objections. This action of the Vestry is met by the Metropolitan Board objecting to the Vestry's *locus standi*, and the grounds put forward for such objection are stated in the notice from the Board to be—

1. Because the Metropolitan Board of Works, and not the Vestry, are the authority for the local management of the Metropolis.
2. Because the Vestry are represented at the Metropolitan Board of Works, and the Vestry have no interest, distinct from other parishes and districts, which entitles them to be heard.

With reference to the first objection, my Committee wish it to be pointed out to your Board that the assumption on the part of the Metropolitan Board is not warranted by fact, inasmuch as there is a far larger share of the local management of the Metropolis in the hands of the Vestries and District Boards than in the hands of the Metropolitan Board. The Vestries and District Boards being the authorities for house drainage and sewerage (except certain main sewers), for cleansing, paving, lighting, and watering streets,

removal of house refuse, nuisance removal, food and drugs analysis, and many other purposes.

As regards the second objection, the Committee wish also to point out to your Board that, although the Vestries and District Boards elect the members of the Metropolitan Board, these representatives are not under the control of the electing bodies, but properly exercise their powers according to their own views; and, moreover, a large minority of the Board may be, and in this instance have been, strongly opposed to the action of the majority.

On the point that the Vestry have no interest distinct from other parishes which entitles them to be heard, the Committee see how this assertion, if admitted, may be made to apply to every Vestry and District Board in the Metropolis, and so leave those bodies without the power of approaching Parliament against any scheme, however objectionable, which may be promoted by the Metropolitan Board.

The Committee think, therefore, that the determination on the part of the Metropolitan Board of Works to prevent the Vestries and District Boards being heard in opposition to their scheme, is one which, apart from the particular question involved in these Water Bills, deserves the serious attention of the Local Authorities of the Metropolis.

My Committee have therefore determined to convene a meeting of representatives from the several Vestries and District Boards:—

1. To consider the objections put forward by the Metropolitan Board of Works to the Vestry of St. Pancras, and (having regard to the points above enumerated) to any other Vestry or District Board being heard by a Parliamentary Committee against the Board.
2. To ascertain the views of the Vestries and District Boards as to whether the Water Supply Bills should be proceeded with by the Board.
3. To consider whether the Vestries and District Boards, who have determined to oppose the two Bills, or either of them, should adopt some joint course of action, with a view to secure *locus standi* before the Committee on the Bills, and against the action of the Metropolitan Board.

The Conference will be held in the St. Pancras Vestry Hall, on Friday, the 15th inst., at four o'clock, and representatives from your Board are invited to attend.

(Signed) THOS. ECCLESTON GRIS, Vestry Clerk.

#### NORWICH WATER-WORKS COMPANY.

The Half-Yearly Meeting was held on the 30th ult.—Mr. H. S. PATTESON in the chair.

The CLERK (Mr. R. Cooper) read the following report of the Directors:—

The accounts of capital and revenue for the half year ending the 29th of September last, now read, have been carefully investigated by the auditors, who have certified to their correctness in the usual manner.

After payment of working expenses, debenture interest, and dividend on the preference shares, and including the balance from the previous half year, there remains a sum sufficient to pay a dividend on the ordinary shares at the rate of 6 per cent. per annum, deducting income-tax, leaving a sum of £491 16s. 11d. to the credit of the next half-year's account. The Directors have, therefore, declared a dividend at that rate, which will be paid to the Shareholders on the 1st of February.

The Directors who retire by rotation are Messrs. Henry Woodcock, William Gadge, and Alexander Robert Chamberlin, who, being eligible, offer themselves for re-election.

A resolution will be proposed at the special meeting to be held this day, authorizing the Directors to raise £20,000 of ordinary share capital, and also to borrow or raise the sum of £5000 on bonds or on mortgage, in pursuance and under the authority of the Company's Act of 1876. The Directors propose to offer the shares by public auction, under the power given by the Act of Parliament, at different periods, as the money may from time to time be required; but the £5000 will not be borrowed till the whole of the £20,000 of ordinary share capital is raised.

In conclusion, the Directors have the satisfaction of assuring the Shareholders that the works are still maintained in the most complete order and efficiency.

The CHAIRMAN, in moving the adoption of the report, said the accounts of the Company were in a satisfactory condition. The customers of the Company were increasing, applications were constantly received for extensions, the water was generally approved of, and the works were in first-rate order. The fact that the law expenses of the Company for the half year were only 14s. showed that they conducted their business peaceably.

Mr. BACON seconded the resolution, which was unanimously adopted.

The retiring Directors and Auditor having been re-elected,

The meeting was made special.

The CHAIRMAN said that in 1876 the Company applied for an Act of Parliament, one of the chief objects of which was for raising fresh capital, as the Company's capital had been almost entirely expended. The Company were constantly receiving applications for further extensions, but it was impossible to make these without more capital. By the Act of 1875, the Company had power to raise £80,000 as ordinary share capital, with borrowing powers of £20,000. What was now wanted by them was authority to raise £20,000, and £5000 under borrowing powers. That amount when raised would not be expended for some time; it would, in fact, only be asked for as required. In answer to a question, why those shares should not be apportioned among the Shareholders generally, the Chairman said, one reason was that the Directors thought every one should have a chance of taking them up. Of course, the premiums they made went to the benefit of the Shareholders. In the second place, there were many Shareholders who would find it inconvenient to take up shares.

Mr. MAGUIRE asked whether it would be advisable to increase the number of Shareholders.

The CHAIRMAN said that the more persons there were brought into the Company the more friends they would have. The feeling of the Directors was that the Company could not be too much extended. The profits obtained by premiums on shares sold up to the present time was £4110.

Mr. PYMAR said the Shareholders obtained no advantage by that, as the Company could not pay more than 6 per cent.

The CHAIRMAN replied that the Shareholders had been benefited indirectly, because 6 per cent. had not been paid until lately.

The CLERK explained that if the proposed shares were not offered to public auction, but were allotted among the present members, the benefit to each Shareholder would be very small. If the sum wanted was £20,000, £80,000, or £40,000 in one sum, the division of the amount among the Shareholders would be some object. But the Company would probably not take up more than £5000 at a time, and that, divided among the Shareholders, would give to each a benefit that would be infinitesimal.

The CHAIRMAN moved—"That the Directors be and they are hereby authorized, from time to time as they may deem expedient for the purposes of the Company, to raise additional capital by the issue of 2000 ordinary shares of £10 each, such shares to be offered for sale by public auction, under the power given to the Company by the City of Norwich Water-Works Act, 1876. And also to borrow and raise the sum of £5000 on bonds or mortgage, in pursuance and under the authority of the said Act."

Mr. BACON seconded the motion.

Mr. AYRIS, the Company's Engineer, said, in answer to several questions, that the Directors asked for power to raise this money from time to time as they required it. Only that morning a kind of indirect application came from the Thorpe Asylum for a supply of the Company's water. The Directors must at once have the power to entertain that application, which would involve considerable expenditure. Another thing which he, as the Manager of the works, was obliged to force on the Shareholders attention, was the necessity of an enlargement of the works at Heigham. When the engines, which were still in perfect order, were put in in 1859, the income of the Company was less than half of what it was now. From day to day owners of houses applied for extensions of the Company's mains and pipes, and it was the duty of the Company, as well as their interest, to keep the works ahead of the requirements of the district, otherwise they would soon come to grief. The Directors would, therefore, be obliged shortly to bring before the Shareholders plans for the enlargement of the works at Heigham. These plans would be carried out in the



course of two or three years. Although the cost of this enlargement would, in the end, be something considerable, yet the money would only be spent from time to time as it was wanted, in order not to put in jeopardy the present dividend. His strong advice to the Directors as to the shares was, that they should be put up to auction. A large number of proprietors would not take additional shares.

Mr. MAGUIRE asked what prospect there was of the Company being taken over by the Corporation.

Mr. AYRIS did not think there was any chance of that. He was now defending the Stockton and Middlesbrough Company, whose works it was proposed that the Corporations of those towns should acquire; but as it seemed likely the Corporations would have to pay the piper heavily, he did not think other Corporations would follow the example.

The resolution was then unanimously adopted.

The thanks of the Shareholders were then given to the Directors for their admirable conduct of the affairs of the Company.

Mr. PYMAR then moved, and Mr. DIX seconded, a vote of thanks to the Manager, Mr. Ayris, for his energetic efforts in behalf of, and watchfulness over, the interests of the Company, and this having been carried, concluded the business.

#### PROPOSED PURCHASE OF THE WORCESTER GAS-WORKS.

At the Monthly Meeting of the Worcester Town Council, on Tuesday, Feb. 5—the Mayor (Mr. F. Dingle) presiding,

Alderman WOODWARD submitted the following motion:—"That the Watch and Lighting Committee be instructed to negotiate with the Worcester Gas Company for the purchase of their works and property in consideration of an annual payment to each Shareholder, based on the maximum dividend to which he is now entitled." In doing so he said the Gas Company were established in 1846, to supply good and cheap gas, and that they were limited to a dividend of 10 per cent., and a capital of £25,000. There were two Acts of Parliament, one of 1846, and one of 1848, and the borrowing powers of the Company were limited to £10,000. The last clause but one in the second Act stated that, when the consumption amounted to 30 million feet, the price should not exceed 5s. 6d. per 1000 feet; and it went on reducing the price up to 48 millions, 6d. for every 5 million feet, thereby clearly indicating that the Legislature contemplated that, as science advanced, and the cost of production decreased, the price of gas also should decrease. Something had been said as to the cost of gas supplied by private Companies in comparison with Corporations. He had taken some pains to ascertain, from a report prepared by the Lighting Committee on the purchase of gas-works by Corporations, the facts with regard to a number of towns, as nearly analogous to Worcester as possible, which were at the present moment supplied by gas provided by Companies, and he found the result to be this—that Worcester was supplied with gas of 22½ per cent. less illuminating power than the towns he had selected; that the public lamps were charged 22½ per cent. more, and that the price to the public was 27½ per cent. more. If they took it in another form, they would find that other towns were selling their gas at 2½d. per candle, while in Worcester they paid 3½d. He had taken 14 towns supplied by Corporations, and he found that the illuminating power amounted to 17½ candles, that the price for that gas was 8s. 4½d. per 1000, and if they calculated the cost per candle they would find the Corporations supplied the candle at 2½d., while the Worcester Private Company supplied the citizens at 3½d., or something like 40 per cent. more. Something had also been said about the illuminating power of the gas supplied by Corporations as compared with that of gas supplied by private companies previous to the former acquiring the works; and he found it to be this—that the Companies (taking towns as nearly analogous to Worcester as possible) supplied gas of an illuminating power of 13 candles, and the Corporations supplied gas of an illuminating power of 17½ candles. Most of the Council would remember with what a fearful face some of the Directors and Shareholders came to the Corporation and asked for an increased price for the gas supplied to the city, in consequence of the increased price of coal. The Corporation always had consideration for those who were in trouble and difficulty, and they met them in the most handsome and liberal manner; but what did he find in the Gas Company's own accounts? He found that in the year 1875 the cost of coal was £10,080, and the gas sold realized £16,277; while, in 1876, the cost of coal being £8486, the gas sold realized £17,746; and in 1877, the coal costing £8024, the gas sold amounted to £18,291. Thus, after allowing a difference in favour of the Gas Company of £1594 in coal alone, comparing the first and second years, the increased production of the lower cost of coal gave in 1876 an increased profit to the Company of £1469, making with another item of £517 for residual products, £3580 profit to the Company upon the decreased cost of coal alone. While for 1877 the decreased cost of coal, compared with 1875, was £2056, the increased profit £2014, on an increased consumption of gas, and the residual products £184, made a total of £4218! And after that the Gas Company told the Corporation they were unable to reduce the price of the public lamps because their profits were so small! It had often been stated, and very likely there might have been some reason in it, that private Companies managed their business much more economically than Corporations did. Well, he had taken the quiet and unpretending little city of Hereford, and made a calculation as to the relative cost of production there and here. In Worcester it cost 65 per cent. of the gas sold. Hereford had lately acquired the gas-works there, at an enormous cost, but what did they learn? The result was that last year, after paying all interest and providing for the sinking-fund, they had a net profit on the year's trading of £2405 7s. 9d. After referring to the contingencies to which Gas Companies were exposed, he concluded by expressing his opinion that the Shareholders of the Worcester Company would do wisely to consider and accept the offer of the Corporation for the purchase of their works.

Alderman JONES seconded the motion. He believed that with the progress of science before them, and the advantage that the public would derive, and the security that the Shareholders would have, no one could see the slightest objection to the resolution. Referring to the report from which the mover had quoted, he said that, taking the case of the very smallest town, Aberavon, and the large towns of Birmingham and Leeds, it would be no mistake to ask the arrangement in question at the hands of the Shareholders. Gas was looked upon, in a very great measure, as public property, inasmuch as there was a very great deal consumed by and for the public. He did not apprehend that the Council would endeavour to wrest the profit of the business out of the hands of the Shareholders. But the time seemed to him to have arrived when it would be advantageous to the Shareholders, and undoubtedly so to the public, to make the transfer. Some might say that the Council were not able to give a large price. What mattered about figures if they got the works at a fair price? Having referred to the large profits made at Birmingham and elsewhere, and the advances which science was making, the speaker said there could be no doubt how the Council would stand in relation to the exchange.

Mr. BOZWARD said that, although elaborate figures had been presented to the Council, comparing Worcester with other places, it had not been shown, if the Council paid the value of the Gas Company's works to the

Shareholders—such as they would be entitled to receive—what profit would result to the citizens. The saying, "Nothing extenuate, nor set down aught in malice," should be observed. He did not mean to say that anything had been set down in malice; but everything done on the part of the Gas Company had been passed over, and nothing had been said about the great and important services which the Company had conferred upon the public of Worcester. He maintained that the Company had fulfilled the promise which was held out to the city to supply good and cheap gas. The old Company charged the city 8s. 4d. per 1000 feet for their gas, and at this moment the price of gas was lowered to no less than 8s. 3d. per 1000 feet. Therefore he ventured to say that the Company had fulfilled literally and exactly all the promises which they made when they went to Parliament to institute the new Company. As to the illuminating power of the gas, he submitted that the burner with which the gas was tested was not the standard one which had been used in other places; the burner which the Council had was an unfair one towards the Company, and he challenged contradiction. If they had the proper burner, such as that which tested the Birmingham or Manchester illuminating power, the Worcester gas would be found to be as good as that of any of the places specified. It ought to be known that when the gas-works were transferred from the old Company to the present Company, the only public body which could have taken to those works were asked to take to them, and deliberately declined. Let the Council just consider what immense service the Shareholders had performed to the city—finding that no public body would take up the works as a public enterprise, the Shareholders took them up and stood in the gap which nobody else would fill, and had since performed all that they promised to do. Having referred to the difficulties which the Company originally encountered, and to the fact that their present prosperity resulted from successful management, he argued upon the point of increased illuminating power, comparing the present with the old Company, when

Alderman JONES interposed, and said there had been no reflection cast upon the Company.

Mr. BOZWARD said he thanked Alderman Jones for this reminder, and at once called attention to the fact that no body of citizens had complained of the gas supplied, or the price charged—only one or two people in the Council had complained. So the Council were not called upon by the citizens to sit in judgment upon the Gas Company—the citizens were satisfied both with the price and the illuminating power. He thought that the Council ought not to move in such a great matter as this unless they had behind them the support of the city. Alderman Woodward was disposed to think that the Shareholders would take annuities for their property; but did the Council suppose for one moment that the Shareholders would listen to anything of the sort? Nothing of the sort. He estimated that the cost of the works would be £150,000. Where were the Council to find the money for their purchase, and if they got the money, what profit would remain after paying that sum? Having referred to the cost of extensions, he observed that it was said profits had been realized in other places. He wished to point out that if the Council were to propose to repay the money borrowed they must increase the price of gas to consumers to enable them to do so; because at present the Gas Company did not propose to pay off their Shareholders. The Council would have to pay a dividend *plus* payment of the debt. Having reminded the Council, as regarded the expenditure of profits in extensions and works, which the Company had been blamed for, that this was the very thing which, if the alteration were carried out, the Council would do, he said that the real sin of the Gas Company was that it was a successful concern, and he asked if it was fair, therefore, that any gentlemen should get an Act of Parliament and, as a person would put a pistol at another man's head and say, "Your money or your life," say to the Gas Company, "This thing is a very good one, too good for you any longer." In conclusion, he maintained that no valid grounds had been given for the Council's interference with the works; that to do so would be to plunge the city in debt to an enormous extent for an exceedingly doubtful benefit; that it would be most unwise to add to the work of the Council by their becoming traders in gas; and that by no scheme could the city be supplied with gas at a cheaper rate than at present.

Alderman LONGMORE, referring to the figures which had been quoted, said it was impossible, on a sudden, to come to a decision as to which were right and which were wrong. The whole argument of Alderman Jones went to this—that it would be a benefit to the Gas Company and the Shareholders to sell. But would it be a benefit to the city to buy? That was the position of the Council—it was for them to consider, not whether it was to the Shareholders advantage to sell, but whether it was to the advantage of the city to buy. Having remarked upon the small number present at the meeting of the Watch Committee when the resolution now before the Council was adopted, he pointed out that what Alderman Woodward and Alderman Jones had said regarding the progress of science was really a strong argument against the Council making the purchase. Then, taking the case of Hereford, he mentioned that whereas the price of gas used to be 4s. per 1000 feet, less 6d. discount, the Corporation were now charging the same price, less 3d. discount only, so that private consumers were now paying more than formerly. The Worcester Company had, in accordance with their Act of Parliament, reduced the price, from time to time, to the private consumers. And now, looking at the price charge in surrounding places, he thought the people of this city were not paying, at any rate more, but on the average less, than many places. He did not hear any complaint from outsiders of the price charged, and he saw there was a notice that the present price would be reduced still more. He did not think there was much reason to complain. The concern had been excellently managed. How would it be managed under the Corporation? He was fearful of that—fearful of running the risk—and, taking it altogether, he thought they would have a majority in accordance with the view that he held—that they had better, if there were ills, "Bear the ills we have, than fly to others that we know not of." Therefore he should vote against the motion.

Alderman WILLIS, with the view of shortening the discussion, suggested that, if the motion were carried, a committee could be appointed to treat with the Gas Company for the purchase of their works. The arguments would come better when the Council knew the result of the interview with the Company; then they would have to deal with the price asked by the Company, and discuss whether it was advisable to purchase or not. He should be quite content to buy at market value—that was, the price shares were valued at in the market; but if the Council should think it advisable to purchase the works at a valuation, or by arbitration, he should strongly oppose it.

Alderman JONES said he had been incorrectly quoted by Alderman Longmore. He distinctly said, in reference to the advantage to be derived by the ratepayers, that they had only to refer to the smallest town, and two of the largest mentioned in the report, and there they got the profits indisputably before them. He directed his remarks upon the two questions.

Mr. AIREY said he had hitherto been in favour of towns of any importance being in possession of both water and gas works, but he admitted his views had undergone a change. Scientific discoveries were becoming such that what might have been desirable 20 years ago might be undesirable to-day.



He should be sorry to give a vote to-day for the purchase of the gas-works, and find, six or twelve years hence, another artificial light entirely superseding gas, and that the gas-works, the property of the Corporation, had become a comparatively useless property. He was reluctant to say it, but not having before him information which he should like to have, he should be compelled to give his vote against Alderman Woodward. He hoped the Council would pause. There were a great many very clever men who certainly thought gas would be superseded. A very influential member of the Council (Alderman Hill) had expressed that idea, and he thought the Council should seriously consider what they were about. A little delay would be a wise policy—they could see what transpired—they were not taking any great harm under the present system.

Alderman LOVESEY said he was opposed to any further delay. Mr. Bozward had tried to alarm them with figures; but if the gas-works were worth the sum he had stated (£150,000), how did he account for their present value, if justice had been done to the gas consumers? The Company had a paid-up capital of £35,000 (£25,000 in shares and £10,000 borrowed), and taking the full sum of this capital (£35,000) the Committee recommended the Council to pay 10 per cent. upon it; that was all that the Shareholders were entitled to under their Act of Parliament. Beyond all question, if the value of the works had been increased to the sum which Mr. Bozward had stated, could the Council doubt for a moment that the price of gas might have been reduced years ago? If they wanted extensions of the works, the Company should have adopted the system which was carried out at Plymouth—asked for increased borrowing powers, and got increased capital, on which they paid 5 or 6 per cent. At Plymouth they had, he believed, four classes of shares, and they had carried out faithfully the principle of their Act of Parliament. There the present price charged was 2s. 3d. per 1000 feet, and £2 10s. for the public lamps. At Worcester they were paying 4s., for every man was not in a position to pay in accordance with the terms of the Gas Company, and therefore, because a man was poor, he suffered an injustice. According to their Act of Parliament, the Company were only entitled to charge 5s. 6d. per 1000 if the consumption reached 30 million feet; and the price was to be reduced, when it reached 48 millions, to 4s. per 1000; but from that period down to the present time it had remained at 4s. per 1000. The consumption last year was over 93 million feet; so that the public got a reduction of 1s. 6d. per 1000 between a consumption of 30 and 48 millions, but between 48 and 93 millions there was no reduction, unless they paid in advance with the Company's terms. He (Alderman Lovesey) submitted that if 1s. 6d. was taken off between 30 and 48 millions, surely a reduction should have been made between 48 and 93 millions. And when they remembered the improvements which had taken place in the manufacture of gas, and also that the value of the residual products had increased, they had a right to expect a reduction of price, in proportion to the consumption, below 4s., the price when the consumption was 48 millions. Mr. Bozward made a great mistake when he said there was satisfaction amongst gas consumers; that was not so, either as regarded the price or the light given. Other towns were getting 16 and 17 candle light; Worcester only 12—12 was in the Corporation contract with the Company. The question was pure and simple: Had the Act of Parliament been carried out in the way that the public had a right to expect it to be carried out? Had the profits, after providing for 10 per cent. on the shares, and £5000 as a contingent fund, gone year after year in reducing the price of gas? He asserted that this had not been done, and that it was right the public should have the very great profits that had arisen. Thirty years ago there was not half the population, and not one-quarter the gas consumed as at present, and Parliament recognized the principle that with all Companies, in proportion as the increase took place, the price should be reduced.

Mr. NOAKE said the Corporation already had so many "irons in the fire" that it taxed their best energies to perform the work they already had in hand, and they could not do that without meeting two or three times a month; and if they were to be saddled with the enormous business proceedings connected with the gas production of the city, he did not know how the work of the Corporation was to be carried on. Another committee would have to be formed; the Council would have to overhaul the proceedings of that committee from time to time, and the consequence would be that they would find themselves in a quagmire. He had great doubts as to the management of a colossal undertaking of this kind by the Corporation, and he was not the only gentleman who had legitimate doubts in that way. He quoted the opinion of several Town Clerks (given in the report), and went on to say that in face of the wonderful improvements and discoveries which were being arrived at, the Council should not undertake to purchase the property of any company at its maximum value, or guarantee the present Shareholders 10 per cent. per annum for ever, when, perhaps, in the course of two or three years, that property would be comparatively valueless. Looking at recent discoveries, and at the prospect that in future years gas would be superseded by some other means of illumination, he thought it was not the interest of the public to purchase. He should have thought the proposition would have originated, not from any Member of the Council, but from the Shareholders of the Gas Company, for certainly the proposal tended to perpetuate the maximum value of the property for ever and ever. It was a most amusing argument that this was an admirable time for the Shareholders to sell, and that they would be wise if they sold; but, by parity of reasoning, if they would be wise to sell, the Council would be acting unwisely in purchasing. The argument cut both ways, and his advice was that it would be much better to "let well alone." If the Gas Company knew their best interest they would from time to time condescend to make as many reductions in the price of gas as would be sanctioned by the condition of their finances and their returns; but, as one of the representatives of the ratepayers of the city, he (Mr. Noake) could certainly never consent to put an everlasting burden upon their shoulders. He hoped that the Council would pause before they committed themselves to any resolution.

The TOWN-CLERK explained, with reference to Mr. Noake's assertion, that the ratepayers would be saddled with a payment "for ever," that if the Council purchased the gas-works they would repay a portion of the principal every year, and that probably the whole would be repaid in 60 years.

The CHAMBERLAIN expressed the opinion that, if coal gas was to be the means of lighting generally used, it would be advisable for the city to become purchasers of the gas-works upon the terms which had been proposed by the proposer of the resolution; but, as had been intimated by other speakers, there seemed to be a great prospect that gas would be superseded, and he was sorry to say that he should not be able to vote for Alderman Woodward's resolution—on this ground, that, only during last week, at the Institution of Civil Engineers, a paper was read upon this very subject, in which several instances were given of large establishments in which other means of lighting than gas were adopted, and it was distinctly stated, and admitted, that in point of economy either the electric or the magnetic light—the magnetic, he believed—stood as two to one, compared with coal gas, and, in point of lighting power, twenty to one in favour of the magnetic light! With those facts before them, which were not denied when the paper was read, he did not think the Council would be

wise in agreeing to become purchasers of the gas-works at the present time. He should be very glad if this resolution could be deferred until some further discussion had taken place upon other lights by engineers who had the subject in hand.

Mr. PARTINGTON suggested that the Council should postpone their decision until they knew the feeling of the citizens generally. Then they would be in a better position to know what to do.

Mr. SCOTT also suggested the withdrawal of the motion for the present. Mr. LECHMERE-PUGH moved as an amendment to the motion—"That a deputation be appointed to wait upon the Directors of the Worcester Gas Company to ascertain if they are willing to sell their gas-works to the Corporation, and, if so, upon what terms."

Mr. RUSHTON seconded the amendment.

Alderman STALLARD failed to see that it had been shown in the report that the public or the private consumers were dissatisfied either with the present price of gas, or the quality, or the quantity, or, in fact, with anything that the Gas Company had done. Therefore, he was surprised to find that Alderman Woodward was pursuing the same tactics that he followed a few years ago, and made assertions against the Gas Company as to their not supplying sufficient light at a sufficiently low price. That had been followed up by Alderman Lovesey in no unmeasured terms, some of whose statements he could not at all endorse. Referring to the statement that the Company only supplied by contract 12-candle light—

Alderman LOVESEY disclaimed anything unfair.

Alderman STALLARD said the return of the Corporation officer would show that by the test at the Guildhall, which was against the Company to a great extent, the average was over 14 candles. The speaker then detailed much of the information given in the report, and on the point as to there being a probability of the price of gas being further reduced if the works were in the hands of the Corporation, he said that the effect of this would be unfair; 2000 people who consumed gas would have the benefit of the reduction, while 6000 or 7000 who were not consumers would not get that advantage. Some Corporations kept up the rates to make a profit, but that, he begged to say, was directly in opposition to the wording of the Company's Act. The gas-works were established by gas consumers, and they took good care to have in that Act a protective clause; and the terms of the Act were these—first of all the works were to pass into the hands of the new Company, for the purpose of affording to Worcester and the suburbs a much larger and better supply; that was done, and after that the Company were restricted in price, as Alderman Lovesey had said, until it got down to 4s. After that, let them bear in mind, the restriction ceased. Dealing with Alderman Lovesey's statement, that the Company were now charging 4s., the speaker reminded the audience that the Company, though charging that figure, only received (allowing discount) 3s. 6d. That might be thought by some to be no advantage to the gas consumers, but the Company had been at a disadvantage of £2000. The speaker went on to refer to Hereford, saying that the price of gas had increased there, and that they wanted to borrow £10,000 to extend the works, in order to meet the requirements of the city. The main question, no doubt, was that the Council wanted to get hold of what was a profitable speculation, and there was no doubt if it had been unprofitable they would have heard little about it. And if they were going to apply whatever profits were made to the reduction of the rates and the improvement of the city, they would be doing so to the disadvantage of the gas consumers. They had just as much right to apply any profits they might make from water to these purposes. He complained that the information in the report was not nearly so full as it ought to be. They ought to have had the length of the mains, the number of the public lamps, the price paid for coal, whether there was a large consumption by day as well as by night as in all large manufacturing towns, who erected the lamp-posts and provided the lamps, and who lighted and extinguished them. At Birmingham the old Company's prices 10 years ago were from 2s. 5d. to 2s. 9d. per 1000 feet, and now, under the Corporation, it was from 2s. 9d. to 3s. 4d., while at Macclesfield the price had risen from 3s. 6d. to 4s. He did not know whether the Corporation could purchase the gas-works without having an Act of Parliament, but he was prepared to say that the Company were not in a position to sell without one.

Alderman WILLIS suggested a postponement of the question for a month, so that in the meantime, if the public liked to take the matter in hand and give their opinions as to whether it was advisable to purchase the gas-works or not, they would be better prepared to vote upon the question, and settle it once for all.

Mr. GOLDINGHAM appealed to the Council not to again postpone the matter. He for one had come to the meeting perfectly prepared to vote, and he was sure his constituency would uphold him.

The SHERIFF had heard nothing showing that the purchase of the gas-works would be to the interest of the ratepayers of the city. All the extensions and works would have to be paid for out of the general rates, and he considered that would not be fair to the non-consumers of gas. He thought that the Gas Company had acted very judiciously in not raising large capital, when they might have done so.

Mr. BOZWARD reminded the Council that out of the 1300 gas companies in the kingdom, the public bodies who had taken over the gas-works might be counted upon one's fingers.

Alderman LOVESEY said the charge some four years ago for public lamps was £3 3s., and then it was raised to £3 10s. He hoped the Company, at their next meeting, would reduce the charge for the lamps to the old price, and so benefit the rates of the city by £200—rates which had to be paid by the poor as well as the rich.

Alderman WOODWARD having replied, consented, with the approval of the seconder, to withdraw his motion.

The Council then divided upon the amendment—to appoint a deputation to confer with the Gas Company as to their willingness to sell. The amendment was carried by 17 to 8, the members interested in the gas-works abstaining from voting, and a Committee of six was appointed to form the deputation.

WHITBY WATER-WORKS COMPANY.—The annual meeting was held on the 5th inst.—Mr. Thos. Thistle presiding. The revenue account for the year showed a disposable balance of £1762, and the Directors recommended a dividend of 9½ per cent., or 19s. per share, on the fully paid-up shares, and 9s. 6d. per share on the shares on which £5 is paid, free of income-tax. This left a balance of £96 3s. 6d. to carry forward to credit. The Chairman moved the adoption of the report and declaration of dividend, which was carried unanimously.

SCARBOROUGH WATER COMPANY.—The *Leeds Mercury* says: "An unopposed Bill to enable the Scarborough Corporation to acquire the local water-works from the Water Company is now passing through Parliament and awaits second reading. In the event of the Corporation agreeing to buy the works at 25 years purchase upon the maximum dividends allowed the existing Company—the terms required by the Directors—the Corporation will then have to decide whether they will carry out the gravitation scheme propounded by Mr. Filliter, C.E., of Leeds, for obtaining a fresh supply. They have instructed Mr. Hawksley, C.E., to inquire and report upon the merits of this scheme."



# YORK UNITED GAS COMPANY'S BILL. RENEWAL OF THE OPPOSITION.

A Special Meeting of the York City Council, convened by the requisition of ten members, was held on Monday, the 4th inst., for the purpose of adopting a petition to Parliament against the Bill of the York United Gas Company. The LORD MAYOR presided.

The TOWN CLERK read a letter from the Parliamentary Agents of the Corporation, in which they expressed approval of the form of petition against the Bill read at the last meeting, and rejected. The Town Clerk said he read the letter in justification of the course he took in preparing the petition, and as a reply to some observations made at the meeting on the 29th ult.

Alderman MARCH moved the adoption of a petition against the Bill, which petition he said was slightly altered from that which was presented to, and rejected by, the Council at the meeting held the previous week, those alterations meeting with the unanimous approval of the Committee. He hoped there would be no discussion, but that the Council would now unanimously agree to it. The petition was to be presented in order that the Council and the city might appear in their proper position. Alderman Leeman, M.P., who had given a very great deal of attention to the matter, came expressly from London, and spent several hours on Saturday along with the General Committee appointed by the Council, and with the Sub-Committee, in deliberating as to the means which should be taken by the Council in opposing the Gas Company's Bill. He might further state that the gentlemen who represented the Gas Company, who met the Committee on Saturday, did so with the very best feeling, and in a very fair manner; in fact, he might say they met the Committee in a liberal manner. He therefore hoped that their fellow-citizens would not have any occasion to find fault—when the deliberations on that question were concluded—with anything the Council had done. He urged the Members to abstain from any discussion, because there were one or two points which had not been arranged, and the Committee were therefore not quite ready to report to the Council, neither were they aware whether the Directors of the Gas Company had acceded to the alterations the Committee had thought it desirable to make in the Bill.

Mr. MANN asked what was the difference between the two petitions.

The TOWN CLERK replied that the eighth paragraph had been struck out, and with that exception and one or two verbal alterations the petition remained the same as the former one. The eighth paragraph was as follows:—"That the said Bill contains no provision for the prospective reduction of the dividend of ten per cent. on the original capital of the Company, and that such provision is, as your petitioners humbly submit, expedient and necessary, and ought to be introduced."

Mr. J. BROWN seconded the resolution, and in doing so said that they had heard that the petition had been considerably modified in a very important particular. The Committee and the Sub-Committee had taken great pains in considering the question, as also had a certain portion of the Directors of the Gas Company, whom they had met on Saturday, and he thought that if the alterations were agreed to, beneficial results would accrue both to the Gas Company and the City. He believed, from what occurred then, they had very reasonable grounds for the hope, although the Council were going to present the petition *pro forma*, that the Directors and the Committee of the Council might make such arrangements that the petition might ultimately be withdrawn. From the reasonable manner in which all the points of difference were discussed on Saturday, and from the way in which the Directors listened to the proposals of the Sub-Committee, all parties seemed to be agreed that it was desirable, in the interests of the city, that the matter should be amicably arranged. He hoped that it would be so, and he, therefore, cordially seconded the resolution.

The petition was then unanimously agreed to.

## FATAL ACCIDENT AT THE IPSWICH GAS-WORKS.

We take the following report from the *Suffolk Chronicle* :—

On Monday, Feb. 4, a sad accident occurred at the Ipswich Gas-Works, by which one man lost his life, and another so narrowly escaped death that he still lies in a dangerous state. About half-past nine in the morning Mr. Ebenezer Goddard, the Engineer of the Works, was going his accustomed round of the works, when, on entering a shed where the manufacture of sulphate of ammonia is carried on, he found two men, William Last, a labourer, and Thomas Noble, the foreman of the works, lying on the ground in an insensible condition. Mr. Goddard at once raised an alarm, and with the help of a labourer dragged the two men into the open air, and sent for Mr. Webster Adams, surgeon. Last, however, died in about half an hour. Noble was removed to his home, and was for a considerable time in a very critical condition. The cause of the two men's insensibility appears to have been this: One of the products arising from the making of gas is ammonia, which is obtained from the gas by passing the gas through water, for which ammonia has a great chemical affinity. A large quantity of ammoniacal liquor is thus produced, and by the process in operation in the shed where these men were found, the ammonia is separated from the water by boiling, and the vapour passes into a tank called a saturator, in which dilute sulphuric acid is made to come in contact with the vapour, the acid fixing the ammonia, and producing sulphate. At certain stages in the boiling of the ammoniacal liquor, other vapours besides ammonia are given off, amongst them cyanogen, a very deadly gas; and a flue is provided in connection with the saturator, by which these vapours are carried off, and, passing through a coke fire, are destroyed. Mr. Goddard found on examination that the lid of the saturator, which is moveable, in order that sulphuric acid may be supplied at intervals, had been left open, and the result of this would be that the cyanogen would, instead of going up the flue, escape into the shed, and, being a heavy gas, collect on the floor. The two men appear to have stooped for the purpose of pouring some sulphuric acid into a jug, and thus to have inhaled the gas. Last was on the morning in question, for the first time engaged on this work; Noble, who was foreman, undertook to instruct him in his duties.

The inquest on the body of Last took place in the afternoon, before the BOROUGH CORONER, H. M. Jackman, Esq.

The CORONER having briefly opened the inquiry, the jury viewed the body, and also the building in which the deceased was found, being accompanied by Mr. E. Goddard and Mr. D. F. Goddard, Engineer and Sub-Engineer to the Company.

Thomas Last, of Dove Lane, St. Helen's, labourer, said the body was that of his son, William Last, aged 36. Deceased was a labourer in the employ of the Gas Company. He was a married man, with two children. He had been for years in the employ of Mr. Goddard, at the Bramford Tar-Works and at the Gas Company's works. He last saw the deceased on Saturday evening, when he was quite well. He did not see him again till that morning, when he was sent for and found him dead. On Saturday, when he saw him, deceased said, "Father, I have got a better place." Mr. Goddard said I deserve a better place." He said, "Father, I dread going, because I think the men might give me a slap on the head." He thought the man whose place he was going to take might be jealous. He (witness) recommended him, if anybody interfered with him, to go and tell the

governor at once. Deceased did not mention the name of the man of whom he was afraid.

Mr. ADAMS, surgeon, asked whether deceased had been under medical treatment for any affection of the heart, or otherwise.

Witness said deceased was in the hospital for a time, about six weeks ago, when he had an accident at the works. Deceased had never complained of shortness of breath. On Saturday he said he felt bad in his head.

Thomas Last, bricklayer's labourer, said he lived next door to deceased. Deceased told him on Sunday, "Tom, I dread my job to-morrow; I'm afraid they'll smack my head." He (witness) said, "If they smack your head, do you tell Mr. Goddard; and, if Mr. Goddard take no notice, I'll make them pay for it myself." Deceased was about to commence some fresh work, and he was afraid some of the others would not like his having it. He thought there was some one who had not quite done his duty, and that he was going to take his place. He believed the man's name was Allison.

John Clarke, general labourer at the gas-works, said he saw deceased first about six o'clock that (Monday) morning, and again after nine o'clock, apparently quite well. About half-past nine or ten, hearing an alarm, he (witness) ran as quickly as possible into a shed, where he saw deceased and a man named Noble lying on the floor. He caught hold of one man, and brought him into the air, and then pulled the other out. Deceased was breathing heavily when he took him out, and died shortly afterwards. He had seen deceased and Noble working together a short time before. They appeared on good terms with each other. The alarm he heard was given by Mr. Goddard. He could give no evidence how the deceased became insensible.

In answer to Mr. GODDARD, witness said it was only a minute or two before that he heard deceased and Noble talking together in the passage leading from the old retort-house to the shed where the bodies were. Deceased was the first taken out, Mr. Goddard helping to carry him out, and he went back again immediately for Noble.

Mr. Ebenezer Goddard, Manager and Engineer to the Gas Company, said: I arrived at the works about a quarter or twenty minutes past nine, and made a survey of the lower part of the works. On going into the shed where the sulphate of ammonia is manufactured, I found Thomas Noble and the deceased both lying on their backs on the floor of the shed insensible. I immediately called for help, and the last witness assisted me in getting both out into the open air. Neither was at this time dead. I immediately sent for Mr. Webster Adams, and applied such restoratives as were at hand. The deceased died within half an hour, but the measures taken were successful in restoring Noble to consciousness. Deceased had been employed for some time in the works, though not in this department. This morning he was to take charge of the ammoniacal works under the instruction of Thomas Noble, the foreman. There was very little instruction required, the process simply requiring care. The process in which he was engaged was the conversion of ammoniacal liquor into sulphate of ammonia. The vapour of ammonia is passed into a vessel containing dilute sulphuric acid. Deceased was quite competent to do what was necessary. The saturator is provided with a flue for carrying off the noxious vapours, the vapour being passed through heated coke. On examining the shed, immediately after the removal of the bodies, I found that the top of the saturator had been left off, and, consequently, the vapours which should have gone up the flue were evolved into the shed. My impression is that the men were stooping down pouring sulphuric acid from a carboy into an earthen vessel. The gas evolved from the saturator, being a heavy one, would collect near the floor, and in stooping both the men must have inhaled it. The inhalation would produce instant insensibility. Deceased would not know the nature of the gas; the foreman probably would. The lid of the saturator should have been closed immediately after being opened, and I regard the leaving it open as an act of inadvertency. Deceased was selected for this work by the Sub-Engineer, my son, because he was a steady, respectable man. The man who had formerly done the work—Allison—had been set to work in the purifying-house. The manufacture of sulphate of ammonia has been going on in the works for about 30 years, and no accident has before occurred. The lid, I think, must have been off two minutes. If the men had been upright they would not have inhaled the gas, for I felt no ill effects when I went in immediately after. The place is abundantly ventilated. Deceased was a nervous man, and to this I attribute his fear that Allison would be aggrieved.

By a JUROR: Noble has been general foreman three or four months. He had to superintend other parts of the works, seeing that everybody was at work, and give any instructions to the men which might be required. Noble has been in the works for many years, serving his apprenticeship as a gas-fitter there, and is a very respectable young man.

A JUROR: Do you consider the lid of the saturator is of the best possible construction to prevent the escape of the fumes?

Witness: It has answered the purpose remarkably well during the past. The practice is to lift it and put the acid in and close it at once.

In reply to another JUROR, witness said a spring or hinges could not be used, as the sulphuric acid would eat up any metal. There were no special instructions to avoid stooping in the shed.

In reply to Mr. HAWKES, witness said, in picking the two men up he risked inhaling the gas himself.

Mr. Daniel Ford Goddard, Sub-Engineer, said he had known deceased for eight years. For about three months deceased had been in the employ of the Company. Previous to that he had been in his private employ at the tar-works at Bramford. About a week ago he asked him whether he wished for another job which would be permanent. He was previously an odd labourer. He said he should like it, and he (witness) explained to him what work it was. He told him he was not satisfied with the way in which the work had been done in the past; that he would be expected to be at work at four o'clock in the morning with a view to lighting the fire at five, when the retorts were drawn; and that his regular wages would be 18s. per week, but if he did the work well there would be some additional bonus. Deceased seemed pleased with the idea, and said he hoped he should give satisfaction. He saw Noble on Saturday. There had been a good deal of trouble about this work, and Noble had suggested Last to do the work. He (witness) said the difficulty was that, beginning work at four o'clock in the morning, the man would have no one with him to show him the different taps, and Noble said if he liked to give him orders he would be there and see that Last got on all right. He told him to do so. He explained to Noble full particulars of the work. He called Noble's attention to the dangerous character of the work, and requested him particularly to have a fire lighted in the flue to carry off the dangerous gases. No written instructions were given. He considered deceased perfectly capable to perform the work. His reason for selecting deceased was his long experience with him in similar work at Bramford. He had no doubt his father had given the correct explanation of the death. There was only one half hour during the process when any dangerous vapours were given off, and this was the time. Allison could have had nothing to do with the deceased's death; he did not think he had been on the works that morning. Noble thoroughly understood the nature of the work from beginning to end. For the purposes of the manufacture it was usual to



put in the sulphuric acid in small quantities. This was always done with a jug, the practice being to close the lid again at once. His (witness's) theory was that, having emptied the contents of the jug, he went to replenish it, leaving the lid open in the meantime. The mere opening of the lid while a jug of acid was poured in would not have allowed sufficient gas to escape.

In answer to questions from the Jury, witness said the only time when dangerous gases were given off was when the liquor was on the boil. After the first half hour this gas was all driven off, and the lid might be left off altogether without danger. The gas was not given off on each addition of the sulphuric acid. The escape of fumes of ammonia told one when it was necessary to supply the acid. The construction of the tank and lid was in accordance with the plan recommended by Mr. Laurie, of Yarmouth, who had had as much experience in these matters as almost any one. It was difficult to use any other kind of lid, as it was necessary sometimes to put the acid in one place and sometimes in another.

Mr. Webster Adams said he attended at the works about half-past nine. He saw the bodies of deceased and Noble. Deceased was quite dead. Deceased died, he believed, from asphyxia, caused by the poisonous gas cyanogen being introduced into the air cells of the lungs. Death probably was not instantaneous. Noble was in a critical state; he was partly conscious when he last saw him. Noble was a stronger man than deceased, but in all probability if Mr. Goddard had not gone in at the moment he would have been dead too. There was plenty of ventilation from the top, bottom, and sides of the shed.

Mr. GODDARD asked witness whether the means adopted to carry off the gases were in his opinion sufficient.

Witness said he thought that with care the means were sufficient, considering the size of the tank, which was a small one.

The CORONER put it to the Jury, whether they were satisfied with the evidence before them, or whether they would desire to examine Noble, in which case they must, of course, adjourn. The question for them would be whether the deceased was properly instructed in the nature of the duties required of him, and, if not, whether blame would attach to anybody or not; and it was for them to say whether or not they could do so without examining Noble. The Gas Company, Mr. Goddard assured him, were anxious that every possible inquiry should be made.

The FOREMAN said he thought there should be some means adopted to warn workmen of the danger of leaving the lid of this tank open. He suggested a rule that the lid be kept shut, on pain of a fine, if necessary.

Mr. E. GODDARD said every precaution possible should be taken, and what had occurred would no doubt make any one else more careful. The work was of a simple character, and this was not reckoned a dangerous manufacture.

The CORONER said the fact that no death had occurred for 30 years was evidence that, when properly carried out, it was not dangerous.

Several jurors raised the question whether Noble was capable of instructing the deceased, and whether he did give instructions; and, after a lengthened conversation, the Jury agreed, with the approval of the Coroner, that the inquiry should be adjourned for a week, that Noble might be examined.

We are glad to learn that Noble is now recovering.

#### HISLOP'S IMPROVED PROCESS OF REGENERATING THE LIME USED IN THE PURIFICATION OF COAL GAS.

As already briefly mentioned in the JOURNAL OF GAS LIGHTING, this subject was recently brought before a meeting of the Chemical Section of the Philosophical Society of Glasgow, by Mr. John Mayer, F.C.S., the Secretary of the Section. We now proceed to place a summary of the paper, and the discussion to which it gave rise, before the notice of our readers.

After explaining that, in arranging for the business of the meeting, he saw that, almost at the last moment, there was to be a blank, which he resolved to do his best to fill up, Mr. Mayer went on to say that his only apology for bringing before the section such an important technical as was indicated in the title of his paper—one connected with a leading branch of chemical industry with which he had no practical acquaintance—was the fact that he had for many years taken a great deal of interest in the chemistry of gas purification, and the secondary or waste products of the gas manufacture, and that during the last few months the process about to be spoken of had impressed itself on his mind as one which was a great step in advance, inasmuch as its use bade fair to be attended with a large amount of economy, and to diminish very considerably the nuisance which seemed invariably to result when "fouled" gas lime was permitted to remain about a gas-works, and more especially when it was being removed as a so-called "waste product." Almost from the very birth of the gas-making industry, the basic alkaline earth, lime, had been used in the purification of gas. For a considerable period, down even to within the recollection of some of those then present, the purifying material was used in the form of a thick milk of lime, in cast-iron tanks; but though the operation was very successful, from a chemical point of view, it was attended with mechanical difficulties that were of so serious a character—in addition to the difficulty of so disposing of the very fetid waste lime liquor as not to create a nuisance—that it was eventually superseded by the use of dry lime purifiers, the slaked lime being laid on trays or grids in covered chambers or tanks, and allowed to remain exposed to the contact of the gas in its passage from the retorts, where it was generated, to the gasholder, where it was stored. Until within the last eighteen or twenty years, caustic or hydrated lime reigned almost supreme as the purifying agent; but when it was experimentally demonstrated that hydrated peroxide of iron might be used with great effect in removing the impurities from coal gas, it began to establish its claims and its popularity over lime in many of the large gas-works throughout the kingdom, and especially in those of the Metropolis. One of its chief advantages was that it did not, by exposure in the open air, become a nuisance in the same degree as spent lime did; and another was that it could be used over and over again. But it was found that, by itself, it was not sufficient for the removal of all the impurities, and some gas managers got into the practice of using it in admixture with slaked lime and sawdust, while others considered it preferable to use the lime and oxide of iron in separate purifiers, which was the plan now generally had recourse to where the last-named compound was employed as a purifying agent. In small gas-works, however, it might be said that lime was almost exclusively used in the purification of the gas, which was also the case in many works of pretty considerable size; such a process, therefore, as that to be briefly noticed in the paper might well aim at becoming very general, if it could only be satisfactorily shown that it was a success—chemically, mechanically, and commercially.

Before enlarging upon the process, the author thought it might be well to notice very briefly what were the impurities which it was desired to remove from the gas. There were some impurities which were simply diluents, and had no noxious character, amongst which might be mentioned hydrogen, carbonic oxide, and nitrogen. No attempt was made in ordinary practice to remove these bodies. Then there was ammonia, which, to some extent, might also be regarded as a diluent, though its presence in the gas at the burner might be said to be detrimental, while its non-removal from the ordinary illuminants of the gas was certainly

indefensible, from a pecuniary point of view, inasmuch as it had now become one of the most important and valuable of the secondary products of the gas manufacture. It was removed from the gas in that part of the apparatus called the scrubber, and its removal was based on the fact of its solubility in water, no lime or other purifying material being required for its abstraction from the illuminating gas. Carbonic acid gas was one of the most important impurities in the gas after it left the scrubber, and yet it should not be forgotten that a quantity of it was separated in that part of the apparatus, chiefly, if not exclusively, as carbonate of ammonia. The author proceeded to say that the only other bodies of which it was necessary to speak as impurities in the gas were the two sulphur compounds—sulphuretted hydrogen and bisulphide of carbon—both of which were very noxious ingredients of themselves, and gave rise to the production of sulphurous and sulphuric acids if they were consumed at the gas-burner along with the illuminating constituents of the gas. The presence of sulphur in the gas supplied to the consumers had of late years become one of the "burning questions" of the day, especially in the Metropolis, during the last few years, under the inspectorial reign of the Gas Referees. Now, slaked lime had a sufficient amount of chemical power to enable it to abstract all the three compounds which had been referred to—namely, carbonic acid, sulphuretted hydrogen, and bisulphide of carbon, and it could be made to remove them so completely as not to leave any material trace of offensive odour in the gas. Latterly, however, it had been found in practice, in the larger gas-works, that the better plan was to remove the sulphuretted hydrogen by means of the oxide of iron, and to separate the carbonic acid in the dry lime purifiers. The removal of the sulphide of carbon was one of the subjects to which a very large amount of attention had been given in recent years by Gas Managers, by the Metropolitan Gas Referees, and by those Chemists who had devoted themselves professionally to gas matters. It was that substance whose presence in London gas really formed the bone of contention between the Gas Companies on the one hand, and the Gas Referees and the Metropolitan Board of Works, as representing the public, on the other. There was no doubt, the author said, that it could be removed until the sulphur should be very much less than 35 or 40 grains per 100 cubic feet of gas, which was not unfrequently the quantity found present on analysis; but the question came to be—"Was the game worth the candle?" The Gas Referees, as the scientific advisers of the Government, replied that it was, in which case the only solution of the difficulty was for the consumers to pay the additional price involved in making the purification more complete, so far as that compound was concerned; for in practice all the sulphuretted hydrogen was removed.

Considering the fact that lime was so universally and so extensively used in the purification of illuminating gas, it might be well to devote a little attention to the consideration of the spent or fouled lime. In some large towns it was practically a valueless material, on account of the expense involved in carrying it away after it had been once used, or, in other words, after it had been "fouled;" but, in many country places, it had some value as a manurial agent. Some time ago a correspondent of the JOURNAL OF GAS LIGHTING stated that he had several hundred tons of gas lime on hand, for which he could find no market, and he desired to know if there was any other way of utilizing it than for agricultural purposes. He got very little satisfaction in the shape of useful information. Still he was informed that, by certain treatment, plaster of Paris might be made from it, and that it could be used as a cement. It might be used to advantage, under certain circumstances, as a fertilizer, and in that light it was carefully studied some years ago by Professor Voelcker, the well-known agricultural chemist. That gentleman examined its composition, and found that in fresh-spent lime, there was usually from 30 to 40 per cent. of water, while in old samples there was a much less quantity. Probably those old samples had been kept under cover, and not exposed to rain. In the solid matter of the sample specially referred to, almost one-half was carbonate of lime, in addition to which there was caustic lime to the extent of fully 18 per cent., thus showing that the purifying power of the lime was far from being exhausted. Rather more than 15 per cent. of the whole was sulphite of lime, a compound which might be regarded as the first stage in the oxidation of the sulphur abstracted from the gas. Sulphate of lime, or gypsum, which was a result of further oxidation, was present to the extent of fully  $4\frac{1}{2}$  per cent. Mr. Mayer quoted other analyses of spent lime, which he referred to at some length, and said that the product in question was of a very variable composition, owing partly to its freshness, partly to the length of time during which it had been exposed to the action of the gas in the purifiers, and to other causes. There was no doubt, he remarked, that by allowing the spent lime to weather in the open air, it would, in course of time, consist largely of sulphate of lime, in consequence of the slow oxidation of the sulphide and other easily transformed calcium compounds. After referring to the very suggestive remarks of Mr. Lewis T. Wright, on the chemical action which takes place in a dry lime purifier, the author proceeded to say that, as to the very complex composition of "fouled" gas lime there could be no doubt whatever; but how to turn the substance to account profitably, and reduce the nuisance connected with it to a minimum, was a question that had occupied the attention of many gas managers, and chemists. Certainly the most successful worker in that field of practical investigation up to the present time, so far as he was aware, was Mr. George R. Hislop, F.C.S., the well-known Manager of the Paisley Corporation Gas-Works. That gentleman had attacked the problem of regenerating or revivifying spent gas lime some years ago. He took some large blocks, and calcined them with coke in the usual way, and the results were upon the whole very successful. The great difficulty, however, was how to recalcine the smaller portions of the lime, and, in order to get over that difficulty, he had a quantity of gas lime passed through a pan-mill, in which the lime was broken down, in order to give it a suitable consistency, and fitted for being easily moulded into bricks, which were introduced into a kiln in the usual way. So far the process satisfied him. The bricks were well formed, and in a way that they could be handled and placed in the kiln. But he was not entirely satisfied with the process, as it was impossible, under ordinary circumstances to make sure that the lime in the centre of the bricks was completely recalcined or revived, and he eventually came to the conclusion that the spent lime must be recalcined in as fine a state of division as possible. His experiments gradually led him to devise a furnace or kiln of special construction for the purpose, and with it he had now been working on a practical scale for many months. Indeed, he had informed the author that the lime which he was using in the purification process at his works was that which he obtained by calcining raw limestone in the ordinary way about a year ago, and that he had now entirely discarded raw limestone, whereas he formerly used from 800 to 1000 tons of that material per annum.

The author said that he had seen the lime-regenerating process in operation several times at the Paisley Gas-Works; he had also seen it in operation at the Greenock Corporation Gas-Works; and in the hands both of Mr. Hislop and Mr. Samuel Stewart it seemed to work exceedingly well, and to be, indeed, a very marked success. Proceeding to describe the process, he said the kiln consist of a series of four calcining chambers arranged vertically over each other, and, together with the furnace underneath them, occupying the space of one of the ovens



of the retort-bench. They are about 9 feet long and 2 feet 6 inches wide. The uppermost, which is the drying chamber, has a capacity fully equal to the united capacity of the other three, which are the calcining chambers proper, and are each about 9½ inches high. All the chambers are constructed of fire-clay tiles and blocks of similar form. The gases from the furnace pass to the further end of the same, where, by means of two ports at the corners, they pass into the lowermost calcining chamber over the top of, and in close contact with, the spent lime, to the fore end of the same; thence up through two ports as before, traversing the second chamber in the same way; then the third chamber; and, lastly, the topmost drying chamber, from which they enter the main flue, the entrance to which is regulated by a suitable damper. The spent lime is first charged into the drying chamber by means of a shovel (from the floor at the Paisley Gas-Works, and from a wagon at the Greenock Gas-Works), and it remains in that chamber during the regeneration of the contents of the chambers underneath; and after the latter have been discharged into an iron wagon or barrow, the contents of the upper chamber are discharged into the lower chambers through a port near to the front of each, the opening of which is covered with a suitable tile, as the chambers are successively filled, commencing at the lowermost, and the gases from the furnace, while passing over, and in close contact with, the spent lime, disengage the carbonic acid and other impurities. Air is admitted through ventilating flue-boxes, placed on either side of the furnace near to the ground, whence it is conveyed to, and directed against, the fuel in the furnace near to the centre of the furnace bars, where it issues from a number of holes, about 1½ inch in diameter, pierced through fire-clay blocks, which form part of the sides of the furnace. These air-holes pass through the blocks with a dip of about 1½ inch towards the furnace-bars. In practice it is found that one man can attend to two sets of chambers such as those just described, and regenerate upwards of 50 cwt. of spent lime per shift of 12 hours, with a consumption of about 8 cwt. of fuel, which is usually the coke of ordinary cannel coal.

Mr. Mayer remarked that so far as the drying and recalcining of the spent lime were concerned, the operations which he had seen at Paisley and Greenock were practically the same; but he had learned from Mr. Hislop that he was making arrangements for carrying out another part of his process, and which, indeed, he had seen in progress. When oxide of iron, he said, was employed along with lime in the purification of the gas, the last-named compound was produced chiefly in the state of carbonate, and was therefore ready for recalcination immediately that the purifier containing it was thrown out of use; and, according to Mr. Hislop, it might be fouled and revived for an indefinite number of times, say a hundred, more or less. But when no oxide of iron was employed, the lime produced was largely charged with sulphur, as well as carbonic acid and other impurities; and while that lime might be restored from 15 to 20 times, or more, before becoming exhausted by its combination with sulphur, forming sulphate of lime, that gentleman had provided in his process that, in order to render the lime more durable, and "go on for ever," as the Editor of the JOURNAL OF GAS LIGHTING had put it, the waste gases from the retort furnaces, boiler furnaces, or the calcining chambers themselves, consisting chiefly of carbonic acid, should be drawn off by an exhaustor or pump, and forced up through the spent lime, after being shut off from the gas as fouled in the purifier. His intention was to connect the chimney, or main flue, with the purifiers by means of cast-iron pipes, laid in a cold water condenser. By that arrangement the carbonic acid from the sources referred to would, on being passed through the sulphuretted lime in the purifier, displace the sulphur chiefly in the form of sulphuretted hydrogen, and combine with the lime to form lime carbonate. The discharged gases from the fouled purifier would then be passed through oxide of iron in an adjoining purifier, the residual gaseous matter being allowed to pass into the open air or into a chimney, and the oxide of iron, after absorbing all the sulphurous impurities, as in gas purification, being removed and exposed to the air for revivification in the usual manner, and the carbonated lime transferred to the calcining chambers, and restored to the condition of quicklime as before.

In concluding, the author regretted that, owing to the short time at his disposal for preparing the paper, there had been no opportunity for getting analyses made of gas lime which had been a number of times fouled and recalcined, so as to see if there was any material and gradual increase in the amount of sulphate of lime. On that point, however, he had been informed that there seemed to be no diminution in the purifying power of recalcined gas lime. In other respects the paper had been incomplete; but he was glad to see Mr. Hislop and Mr. Stewart present, both of whom would doubtless be willing to supplement his remarks from their own practical experience of the process.

A discussion then took place.

Mr. J. J. COLEMAN, F.C.S., said that it would be essential to the financial success of the process that all sulphur compounds should be removed from the gas prior to the latter being brought into contact with the lime, otherwise there would, he thought, be a progressive deterioration of the lime each time it was recalcined. He considered that this would practically be very difficult to manage. If the lime were deteriorated only to the extent of 10 per cent. at each reburning, by accumulation of sulphates or sulphides—a not unreasonable possibility—then by the end of the fifth recalcination the cost of reburning would exceed that of fresh lime. The removal of sulphur from coal gas by ferric oxide, and its recovery from the oxide by conversion into sulphurous acid in the vitriol chamber furnace, or its recovery in the free state by the process of Pelouze (now in operation in London)—namely, by solution in hot coal tar naphtha and subsequent crystallization, were operations of great interest, and likely to have an important influence in rendering us independent of foreign sources of supply.

Mr. SAMUEL STEWART, Greenock, remarked that he had been using the process, and burning the spent lime for about two months, during which time he had reburnt about 100 tons of the lime, or, in other words, about double that quantity of spent lime, for the latter lost nearly half its weight in the process of revivifying. He had found no difficulty or mystery in recalcining the spent lime. The recalcining chambers at the Greenock Gas-Works occupied the place of an ordinary oven of retorts in the retort-bench, and they were worked at six-hour charges, producing something like 45 cwt. of reburnt lime per 24 hours. The lime was found to stand in the purifiers equally well with, and also about the same time as, the "shell" lime, even after being recalcined several times. He said, however, that he only used lime to remove the carbonic acid from the gas, the sulphuretted hydrogen being removed by means of bog iron ore. The spent lime, therefore, contained very little sulphur. Speaking of the "life" of the chamber, he said that he estimated that it would be equal to the production of from 800 to 1000 tons of reburnt lime; and he calculated the expense of renewing the chamber at from £40 to £50, or about 1s. per ton of reburnt lime. Owing to the distance of his purifiers from the retort-house, he had an additional item of expense over Mr. Hislop for wheeling the lime. That made the cost of reburning the lime so much dearer at the Greenock Gas-Works. Still, he found that the cost of labour and fuel did not exceed 9s. per ton, or, adding 1s. for renewal, say 10s. per ton, or about one-half the cost of new "shell" lime. Not having had

an opportunity of getting either the spent or reburnt lime analyzed, he was unable to say if all the impurities were driven off by the reburning.

Mr. JAMES R. NAPIER, F.R.S., asked if the process could be employed profitably in small gas-works.

Mr. MAYER replied that as yet there was no experience on that point, but he understood that the patentee was of opinion that it could be so worked, even in very small works.

Mr. JAMES HISLOP, Maryhill, had no doubt that there were certain limits in regard to the application of the process in question, as there were in regard to many other processes. It would certainly not be profitable in very small gas-works where fuel had to be purchased even for the heating of the gas-retorts; but, to put the matter in a general way, it might be stated that in works producing annually 3 million feet of gas and upwards, the regeneration of foul lime might be profitably carried on.

Mr. D. M. NELSON was of opinion that the process could not be economically conducted on a very small scale.

Dr. WALLACE, Gas Examiner, Glasgow, remarked that if any sulphur compounds remained in the spent lime, the burnt lime would contain sulphate. He had found that when limestone containing pyrites was calcined, the product retained fully half of the sulphur in the form of sulphate. The value of the process would, therefore, depend very much upon the extent to which the sulphur compounds were got rid of before calcination. Again, the utility of the invention would depend upon local circumstances. In London, for example, the process would be invaluable; and in places where the spent lime could not be disposed of advantageously it would undoubtedly be profitable. But in such towns as Glasgow, where the waste lime was readily sold, it became simply a question of cost whether it would be better to revivify the spent lime or use fresh material every time. The price got for spent lime in Glasgow was from 1s. 6d. to 2s. 6d., per ton, which was equal to from 3s. to 5s. of the cost of the original lime, and that amount added to 9s. as the probable cost of revivifying, came pretty close upon the value of burnt Irish lime—that was to say, about 16s., all charges included.

Mr. W. KEY, Tradeston Gas-Works, Glasgow, also made some remarks upon the relative cost of fresh lime and recalcined lime, so far as Glasgow was concerned. At his works the "shell" lime was obtained very economically from Irish limestone, and the farmers readily purchased the spent lime.

Mr. STEWART remarked that Irish lime "shells" laid down at his works cost from 19s. to 20s. per ton, or about twice of the expense of recalcining spent gas lime.

Mr. G. R. HISLOP, Paisley, at the request of the President, next addressed the meeting. He said that, not being a member of the Society, he had attended, on the invitation of Mr. Mayer, simply as a listener to what might be said on the subject discussed in the paper. He expected that had Mr. Mayer's paper come on a week or two later, he would have been in a better position to state important facts in connection with the subject, and to have been able to submit analyses of the lime at the different stages of the process, and after several reburnings; but he was only then engaged in perfecting the desulphuretting part of the process. Undoubtedly, it was of great importance to have the last vestige of the sulphur discharged from the fouled lime before recalcining it, and this he proposed to do by means of the carbonic acid produced in the gas-retort furnaces, sufficiently cooled and passed up through the lime in the purifiers, so soon as they were turned off as fouled. In that way the carbonic acid gas, passing through the myriads of channels formed in the lime, would very speedily discharge the sulphuretted hydrogen, which in its turn would be passed into the oxide of iron. The simple acetate of lead test would indicate when the whole of the sulphuretted hydrogen had been expelled. By that part of the process the valuable sulphur, which had been largely, and in most cases, thrown away as waste, would be recovered. It was by no means a small quantity of sulphur that was allowed to go to waste; for, after allowing for what might be removed by the scrubbers and washers, it would amount to from 10 lbs. to 13 lbs. per ton of coal carbonized. That was a point not to be lost sight of. Mr. Stewart, who, like himself, purified his gas partly by oxide of iron, intended, in the meantime, to burn his lime with what little sulphur it might contain; and, with regard to the number of times it might be recalcined, he (Mr. Hislop) might state that, of the 60 or 70 tons of lime which he had had in use at the Paisley Gas-Works for the past twelve months, a portion which had been fouled 45 times (and, in several instances, made specially foul for the purpose of experiment), contained only 22½ per cent. of sulphate of lime. Then, as to the value of the spent lime, as ordinarily produced—like Mr. Stewart, he had always had considerable difficulty in getting it disposed of. Not unfrequently, at least in mid-winter, he had sold it at from 4d. to 10d. per ton. But, even supposing that 1s. 6d. per ton could be got for the spent lime, as Dr. Wallace had stated, and that it required nearly two tons of spent lime to produce one ton of quicklime, Mr. Hislop found that well nigh, if not even fully, this sum would be saved in the preparation alone of the reburned lime, which required no riddling or screening, inasmuch as it contained no stones, and altogether it was much more speedily prepared for use. Speaking of the cost of producing quicklime direct from the raw stone, he said that, before resorting to the regular use of his revivifying process, he had produced all the lime required at the Paisley Gas-Works from Irish limestone, and he quite agreed with Dr. Wallace on the question of first cost. The material could not be produced for less than the amount mentioned—namely, 16s. per ton.

The PRESIDENT (Professor Ferguson, M.A.) then summed up the discussion in a few remarks, and, in proposing the thanks of the Section to Mr. Mayer for his interesting paper, he expressed a hope that another paper on the subject would be brought forward at a future meeting, in which the desired analytical results would be embodied.

REDUCTION IN THE WASTE OF WATER AT LIVERPOOL.—At the meeting of the Liverpool Water Committee, on Monday, the 4th inst., Mr. Deacon, the Engineer, reported that the 20 reducing valves, which the Committee, on Nov. 24, 1876, instructed him to make and fix, had now been in operation for about nine months, and he was therefore in a position to lay before the Committee a statement of the result of the application of the valves. The consumption of water in the 20 reducing-valve districts had been ascertained from the meter diagrams for a period of six months before and six months after the valves were fixed. The consumption in the districts during one week immediately before the valves were fixed, and that during one week at the present time, had also been calculated. In both cases the reduction shown in the consumption, consequent upon the introduction of the valves, was three gallons per head per day. Applied to the population of the districts, this amounted to 211,200 gallons per day, and to 77,088,000 gallons per annum. At the present cost price of the water distributed by the Corporation, its value was about £2250 per annum. The cost of constructing the valves ordered by the Committee had been less than £6 each. He estimated the average cost of constructing these valves in future, including covers and any syphon chambers which might be necessary, and of fixing, at £8 10s. each. Allowing for all contingencies, the cost would not exceed £10 each. He recommended that 25 more valves should be constructed. The report was adopted.



## WATER GAS IN AMERICA.

By Mr. ROBERT BRIGGS, C.E., Philadelphia.

The publication in the *American Gaslight Journal*,\* of analyses of gas made by the Lowe process, at Harrisburgh, Pa., by Professor Henry Morton, of the Stevens Institute, brings up anew some old questions as to the chemistry and physics of water gas, and as to its suitability for general public and private use as illuminating gas.

Professor Morton's analyses may be accepted fully as exhibiting the most favourable production of this gas as a process. From these analyses it is made evident that through the action of heat a certain volume of steam has been separated into its original elements of hydrogen and oxygen, or at least the hydrogen component has been set free, and the oxygen taken up by, or absorbed chemically into, such proportion of carbon (which was present as incandescent anthracite coal) as will form carbonic oxide. The hydrogen and carbonic oxide are shown by the analyses to be, say, 30 per cent. each, or together 60 per cent. of the gas at Harrisburgh, while the remaining 40 per cent. is composed of marsh gas and petroleum vapours, which 40 per cent., may be taken as having its derivation from the benzine or petroleum, the use and distillation of a certain quantity of which is a part of the Lowe process; the Harrisburgh gas, like most of the recent water gases, deriving its illuminating qualities from this source in place of the canal coal, rosin, oil or other substances which were used in the older processes. The analyses do not exhibit the exact proportions stated above, but the most of the variations between them and this statement are due to imperfections of production inseparable from all processes which may give rise to carbonic acid gas, and which do not in any way eliminate the original impurities of the fuel or the petroleum. A theoretically perfect water gas for illuminating purposes can be accepted to have very nearly the constituents stated above.

Let a consideration be had as to what occurs in the dissociation of water, the elimination of the hydrogen, and the formation of the carbonic oxide of this assumed volume of 60 per cent. of the gas. One pound of hydrogen is found in 9 lbs. of water (or of steam, which is water vaporized by heat); and 1 lb. of hydrogen in burning with 8 lbs. of oxygen will give out 62,000 units of heat, forming in this manner the 9 lbs. of water. [A unit of heat (English) being the heat of elevating the temperature of 1 lb. of water one degree.] The dissociation of water to again form hydrogen and oxygen will necessarily have a cooling effect—that is, heat must be supplied from other sources, equal to 62,000 heat units. In this Lowe process a certain portion of the heat is supplied at once in the vaporization of the water into steam. Suppose the condition of the steam, when it reaches the incandescent fuel, or material which is to decompose it, to be equivalent to dry steam at 212°, then 966 units of heat will have been expended on each pound in vaporization from 212°. [In the data which gives 62,000 heat units as coming from the combustion of 1 lb. of hydrogen, the assumption made was that the hydrogen was burned from some usual temperature, say 70°, and the products reduced to that temperature, when the latent heat of evaporation became 1065° in place of 966°; but as, in this case, the products of combustion are of much higher temperature than 70°, the 99° which would follow from perfect utilization of the heat may be considered as expended in imparting heat to them. This supposition does not imply merely the addition of 99° to the temperature of the resulting gases; here the low specific heat of these gases causes the 99° in units of weight of water to be equivalent to 216° in units of weight of gas, while as there are 15 lbs. of gases to 9 lbs. of water, the temperature of the 15 lbs. becomes 130°, which, added to the 212°, gives 342° as the temperature of the escaping gases. It may be well to remark here that the numerous attempts to gain an increment of heat by superheated steam when making water gas have been failures from the physical conditions. The quantity of heat wanted is enormous, when the small amount of steam, which is the supposed vehicle, is considered. Suppose the steam to be under constant pressure, and suppose that its specific heat remained the same at high temperatures, theory demands that the steam should be heated to 12,330° and at once fall to 70° when dissociation occurs. There is scarcely any practical application to be made of superheated steam.] Following the supposition that the heat of evaporation at 212°, or 966 units, is supplied as a preliminary to the gas-making process, the 9 lbs. of water will have furnished  $(9 \times 966) = 8700$  units of heat, leaving 53,300 units as requisite to complete the elimination of 1 lb. of hydrogen.

The process from this point is as follows:—9 lbs. of water with 6 lbs. of carbon will, from the action of heat, yield 1 lb. of free hydrogen together with 14 lbs. of carbonic oxide, made by the combination of 8 lbs. of oxygen with 6 lbs. of carbon. The combination of each pound of carbon with the oxygen will evolve 4400 units of heat; whence  $(6 \times 4400) = 26,400$  units will be eliminated from this source. This leaves  $(53,300 - 26,400) = 26,900$  units of heat to be supplied by contact of the gases with heated coal, or other heated bodies such as fire-bricks or retort surfaces, the temperature of which must be above that of dissociation, even after parting with large quantities of heat. The heat to be supplied to these incandescent materials must evidently be derived by the burning of fuel other than that which furnished the carbon for the carbonic oxide. The resulting volume of these 15 lbs. of gas is 377 cubic feet at 70°, the specific gravity of the mixture of hydrogen and carbonic oxide is 0.52 (as compared with air unity), and there is 25.73 cubic feet of the gas to the pound.

The claim of the "Lowe process" is that 50 lbs. of anthracite and 3 gallons of petroleum (benzine) will make 1000 cubic feet of illuminating gas of somewhat above standard quality on an average production. It is understood that about 4000 cubic feet is the result of each effort, or "run" of the process. Reducing Professor Morton's figures, there appears to be requisite for the production of 4000 feet of the gas—

64.9 lbs. of water in the form of steam.

38.4 lbs. of carbon in the form of anthracite coal devoid of ash.

80.0 lbs. of hydrocarbon in the form of petroleum† products of destructive distillation of benzine or petroleum.

2.7 lbs. of atmospheric air.

186.0 lbs. of gas of 0.62 density = 0.0465 lbs. per cubic foot at 70° = 4000 cubic feet in all. [In fact this gas must have had 1 to 1½ per cent. in volume of aqueous vapour, but it may be supposed that Professor Morton neglected this in his analyses, and refers to dry gas.]

The formation of this 4000 cubic feet of gas, so far as the chemical changes accompanying the formation of water gas is concerned, involves the expenditure of about 163,000 units of heat. The heat demanded for the distillation of the petroleum is altogether uncertain. Some theories suppose that little or no heat is expended in such a distillation, only that the attaining of some given temperature for an instant of time releases the atoms of the hydrocarbons, so that they form new elective combinations, any of which will produce heat when burned in combination with oxygen proportionate to the quantities of carbon and hydrogen in each of them. But it is clear that a high heat must be attained and preserved in

the vessels of decomposition—retorts, generators, or what not—and that these vessels are exposed to great losses of heat to the surrounding air. If 500,000 units of heat were taken, as a guess, for the requirement of heating a "run" of the Lowe gas, and the average yield of heat from anthracite coal of fair quality of 10,000 heat units to the pound be accepted, then 50 lbs. of coal per run would be required for this purpose. The 38.4 lbs. of carbon which form the material of gas-making may be held to result from 45 lbs. of anthracite coal as above, so that 95 lbs. of anthracite become the estimated quantity for a run of the process. The 80 lbs. of hydrocarbon could proceed as a least quantity from 11 gallons of petroleum of 0.87 density. It is claimed for the Lowe process 200 lbs. of anthracite and 12 gallons of petroleum will yield 4000 cubic feet of gas; the theoretic quantities based on Professor Morton's analyses may be considered as 95 lbs. of anthracite and 11 gallons of petroleum. The loss from the estimated best result is 105 lbs. of anthracite and 1 gallon of petroleum each run.

Taking any of the water gas processes, including and since that of White in 1852, whether by "generator" or by "retort," as the means of exposing the water to the heat of dissociation, the result of the Lowe process at Harrisburgh compares favourably both in fuel and in product. If such gas as Professor Morton describes can be made as a general thing from the materials claimed by the Lowe people, without inordinate wear upon the apparatus, the success of this new water gas project is but a question of time.

The remainder of Professor Morton's paper, referring to the character of this gas, in regard to its suitability for public use for illuminating gas, is open to grave question as to the facts and deductions, and seems to demand an answer to prevent a popular spread of such views. The issue was made, considered, and determined years ago, not only with "water gas," but with other coal gas of any kind. Undoubtedly, "the presence of even a few per cent. of [any illuminating gas as well as of] this gas in the air of a room renders it utterly unfit for breathing, and often even fatal." But carbonic oxide gas is not "one of the most virulent and dangerous of gas poisons," and no serious difficulty does arise from the presence of carbonic acid gas, whether resulting from the burning of carbonic oxide, or of carbon in other conditions of gaseous combination, in vitiating the air of rooms as usually constructed and occupied, where illumination, in the ordinary sense, proceeds from such burning.

As a gas, carbonic oxide, pure and simple, is but in the least degree more dangerous than ordinary coal gas. The Professor can try for himself on the lower animals, and I am convinced he will find poor "pussy" quite as quickly affected, and quite as difficult to resuscitate, and quite as little poisoned with the second as with the first; and that the per centage of gases present in the air necessary to produce asphyxiation in nearly equal times will not materially vary. From personal inquiry which I made a few years since at a gas-works, where a water gas process continued in use for a long time, I obtained such information as to induce me to believe that no poisoning whatever followed the inhalation of carbonic oxide. It did seem to be more active in causing insensibility—in knocking a man over, as a workman said—but no real disaster, or even serious case of suffocation ever happened. Headaches, of the same intensity of discomfort as those which follow the accidental breathing of coal gas, were the worst resulting effect. Certainly any one who will breathe an atmosphere largely composed of coal gas will be suffocated unless promptly removed from the locality.

It is easy to write that "the presence of a few per cent. of gas in the air of a room renders it utterly unfit for breathing, and often even fatal," but it is well to consider what a few per cent. means. There are many persons who habitually sleep in chambers of no great size (cubic capacity), and which have no especial provision for ventilation, with a gaslight burning all night; while there are few who from some cause may not have done so frequently, or at least at times. An ordinary small bedroom of the smallest size may be taken as having 100 square feet of floor (10 feet  $\times$  10 feet or 8 feet  $\times$  12 feet) and to be 9 feet in height, having thus 900 feet capacity. In such a sleeping-room, with one or two occupants, a gas-burner is often permitted to remain lighted all night. Suppose the burner to consume ordinary quality and density of coal gas, at the rate of 5 feet per hour, the burning of this gas would evolve in the same time 0.315 pounds of vapour of water, and 0.346 pounds of carbonic acid gas, the volume of the latter substance being 3 cubic feet, at a temperature of 70°.

In the absence of any specific gravity figures for the Harrisburgh gas, the density of the vapours or gases designated as olefines can be taken to agree with that of olefant gas (= 0.981), when a careful computation of the data, which is otherwise ample for the exactness of this statement, gives a specific gravity of 0.62; that of ordinary coal gas, of 14 to 15 candle power, being 0.43. The same computation which gives the density finds nearly the same quantity of carbon present as in the same weight of ordinary coal gas; but as the volumes of these gases vary inversely with their specific gravities, that is as 0.43 to 0.62, it follows that a cubic foot of Harrisburgh gas contains 44 per cent. more carbon than a cubic foot of ordinary coal gas. Here, again, the data fails; no report of the illuminating value of Harrisburgh gas accompanies the analyses. If this is on an equality in illuminating power with coal gas, then 44 per cent., and not 70 per cent., as given by Professor Morton, more of carbonic acid gas will be evolved in giving equal light in equal time.

But this discussion as to proportionate quantities of carbonic acid gas is an episode in the argument. About 3 cubic feet of carbonic acid gas come from the burning of ordinary coal gas, with a 5-foot burner, each hour. Not the slightest ill effect follows to the occupant of a sleeping or other room from this hourly supply. If it were all retained in the room, from complete absence of ventilation, it would take three hours before the supposed bed-room, of 900 cubic feet capacity, would have one per cent. of carbonic acid from this source alone. The exhalations of breath give out about 0.6 cubic foot of carbonic acid gas in an hour's time, so that in an occupied room of 900 cubic feet capacity, entirely closed from ventilation, one per cent. of carbonic acid might accumulate in less than three hours; while with any reasonable ventilation, suited to render such a chamber habitable, the reaching of one per cent. is a simple impossibility in any length of time of probable gas burning and occupancy whatever. In reality, seven-tenths of 1 per cent. of carbonic acid gas has been found in crowded, long occupied, closed rooms, under conditions of external atmosphere as regards temperature and moisture peculiarly unfavourable to diffusion, or to inducement of natural ventilation, and at no other times. The ultimate product of combustion of carbon is aptly stated by one eminent chemist as "an invisible, innocuous gas," and the same may be said of the product of combustion of hydrogen. Both of these gases are excreted cutaneously from all animals, and the presence of either of them in an atmosphere of habitation to the proportions of a few per cent. will be found decidedly unhealthy, rising to the point of danger by interrupting the natural secretions. Carbonic acid gas must be diffused, while aqueous vapour will not only diffuse, but will condense, so as to reduce the per centage present in air at temperatures far above those of comfort or of nature in the habitable part of the globe.

On the other hand it must be admitted that all illuminating gas is very dangerous when permitted to escape into a room unburned. The same

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† In this estimate of petroleum I take the proportion of marsh gas to olefines as that given by Professor Morton, considering the density of the olefines to be equal to that of olefant gas; an approximate result, of course, follows.



course of reasoning which has been followed with regard to carbonic acid gas can be applied to unburned coal or other illuminating gases, with correction for time, in that the last gases will be supplied to a room as 5 feet to 3 feet of the first. But far less than one per cent. is dangerous. Whilst writing this article, within a single week, the newspapers give four resuscitations of persons in hotels, in different parts of the country, who had had three or four hours exposure to the effects of gas escaping from a burner in the bed-chamber. The chance of any person surviving who goes to sleep with an extinguished open gas-burner in his closed room, and remains unawakened until morning, is not very great. What, however, I wish to show distinctly is that there is little choice as to whether the gas of suffocation, in such case, shall be 30 per cent. of carbonic oxide, or have the same 30 per cent. substituted by marsh gas.

For nearly 30 years the efforts to make a water gas have been repeated and persistent; success had been a remote accomplishment—the place where it has been reached has always been a long way off; and, by a curious fatality just at the time when, at any place, complete success has been reached, the processes have been superseded or suspended. The Lowe process differs from other "generator" processes in the intermittent action, so that the resulting gas is nearly free from nitrogen derived from the air of combustion, which supplies the heat to effect the dissociation of water. As to the final, economical, or practical result of this process I express no opinion; it remains to those who are interested in it to develop it if they can; but it is clearly proper that it should have a fair chance on its merits, and that it should not be condemned upon the hypothesis that it is especially dangerous above ordinary coal gas, or that it is too dangerous to use.

There is, however, one other question of great public interest, in connection with this and other novel gas processes which are being offered to form the bases of rival gas companies in our cities. Is it really good policy for our legislators to grant, or for our capitalists to encourage, or a sound political economy, for our writers to advocate the wholesale destruction of property which is involved in the formation of a new gas company, to occupy the best portion of a city already provided with means for supplying any demand for gas lighting? The greatest saving imaginable in the cost of gas-making is but a small item in the profits of a gas company, when estimated with regard to the income from that portion of the territory covered by the company's distribution, which brings a really remunerative return on the prime investment. Gas, at any cost of practical gas-making, high or low in cost, can be sold at a great reduction from the uniform price, at a profit, to consumers resident within a certain one-sixth or one-eighth of the area of any of our cities.

This train of argument would open a discussion much longer than should be based on a consideration of analyses of HARRISBURGH water gas. That man may be a great benefactor to his species "who makes two blades of grass grow where one grew before;" but it may remain a mooted point whether the inventor who has succeeded in getting two capitals, and two supplies for one demand, has really achieved what is conducive to the public good.—*American Gaslight Journal*.

**ECKINGTON WATER COMPANY.**—At the annual meeting, on the 4th inst., the Directors report on the past year's working was read, showing that over 570 houses were now using the Company's water. The amount available for dividend was £395 19s. 1½d., which sum the Directors advised to be used in paying an 8 per cent. dividend, which would leave £70 for the reserve-fund. The recommendation was adopted. The report also showed that the income of the Company had increased to such an extent as to allow of a concession being made in the prices charged for the water. The Chairman stated that there had been several rumours afloat about the Directors wanting to sell the water-works; but he was in a position to say that the rumours were false.

**HULL GAS SUPPLY.**—Mr. James Baynes, jun., reports that the results of his analyses of the gas supplied to the East district, by the Sutton, South-coates, and Drypool Gas Company, during January were as follows:—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16.30	15.42	15.78
Grains of sulphur per 100 cubic feet	—	—	13.58
Grains of ammonia per 100 cubic feet	—	—	8.63
Mean barometer and temperature in experiment-room—Bar., 30.07; temp. 47°.			

**BODMIN GAS CONSUMERS COMPANY.**—The annual meeting was held on the 4th inst.—Mr. S. Hicks in the chair.—The report of the Directors showed an available balance of £469 7s. 3d., out of which they recommend that the usual dividend of 8 per cent. should be declared. Since the last general meeting enlarged mains, from the Gas-Works to the Military Brigade Depot, had been laid down, and the Barracks had now a full supply of gas. This supply, and the increased demand from ordinary customers, had necessitated extensive alterations and additions to the works and enlarged mains in Fore Street, portions of which had been completed and the cost included in the year's accounts, but a further outlay would be required for the purchase of a larger gasholder and purifiers. The actual and estimated cost of carrying out these works would be about £1400, towards which sum the War Department had contributed £400. The Directors, therefore, in order to be enabled to complete these extensions, recommended that the sum of £1000 should be borrowed on the security of the plant. The report was unanimously received and adopted, and it was resolved that the £1000 should be borrowed at 4 per cent. interest. Two of the Directors, Messrs. J. M. H. Cardell and S. Hender, who retired by rotation, were re-elected, as were also the Auditors, Messrs. Crabb and J. E. Collins. The usual votes of thanks were cordially given to the Chairman, Board of Directors, Auditors, Secretary, and Manager.

**LIMERICK GAS COMPANY.**—An extraordinary meeting of this Company was held on the 5th inst., at the City Terminus Hotel, London, for the purpose of considering the provisions of the Bill now before Parliament for transferring the undertaking to the Corporation of Limerick. Mr. Paddon, who presided, said the Bill promoted by the Corporation gave effect to certain agreements already entered into with the Directors for purchasing the property of the Company; but it was necessary, before the measure could proceed, that the Shareholders should formally signify their approval of it. The Directors had given all the clauses of the Bill the most careful consideration, and they saw no reason whatever to object to any of its provisions, or why the proprietors should not give it their approval. He concluded by moving a resolution to that effect. The Parliamentary Agent of the Company then briefly explained the clauses of the Bill more particularly affecting the interests of the proprietary, and mentioned that a new clause had been added at the instance of the Directors, providing that, if the purchase was not completed by the end of the next year, the agreement would become null and void. Mr. Godfrey seconded the resolution. In reply to a question, the Chairman said that the gross sum to be paid for the purchase of the works was £45,000, but that amount would be reduced some £12,000 or £13,000 by certain engagements entered into by the Directors, so that they expected to have for division among the proprietors from £30,000 to £32,000. In his opinion these were very favourable terms. The resolution approving the Bill was then adopted *nem. con.*

## IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The amount of business doing in the various branches of the iron trade in this town and neighbourhood is still on a minimized scale, and there does not yet appear to be any chance of an early revival, albeit a rather more hopeful feeling has arisen out of the conclusion of the armistice, and the proposed changes in the American tariff. In neither case, however, is the "assurance" so "sure" that measures may be based upon the assumption that they are reliable; hence the long looked-for revival is still a matter of the future. Despite this not very cheerful outlook, however, the current production of the blast furnaces is steadily good, particularly in North Derbyshire, and a good deal of the total output is being delivered, either on contracts or current sales, although at two or three establishments stocks are still on the increase. Good Derbyshire and Yorkshire foundry brands range from £2 5s. to £2 11s. 6d. per ton, whilst forge numbers are 5s. to 10s. lower, according to quality, and the ordinary North Yorkshire pigs are quoted as under:—No. 1 foundry, 43s. 6d.; No. 2 foundry, 42s.; No. 3 foundry, 40s.; No. 4 foundry, 39s.; No. 4 forge, 39s.; mottled, 38s. 6d.; white, 38s.; refined metal, 57s.; Kentledge, 42s. 6d.; and cinder, 55s.; all per ton f.o.r., for net cash. Some of the hematite brands are rather easier in price, one house having lowered 2s. 6d. per ton last week. Merchant irons are neglected, much as heretofore, and in manufactured irons there is very little business doing. The Belgians continue to beat us in the matter of girders and other constructive iron.

Of fuel there is little that is novel to report, save that at Renishaw the question of lower wages has been postponed, whilst at Shireoaks a difficulty has arisen, owing to a new way of filling the corves with hard coal. There is a fair amount of business in household coals, but prices yield no more than a very bare margin of profit to the merchants.

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There has been a slight improvement in the demand for the better classes of round coal, in consequence of the colder weather of the past week; but this has had no material effect upon prices, as supplies are still abundant in the market, and the production could be readily increased to meet any extra inquiry that can be expected. In other classes of fuel there is no change, the unsettled and depressed state of trade throughout the district naturally affecting the demand for all descriptions of fuel for manufacturing purposes, and the keen competition which has to be encountered from other districts, especially Yorkshire and Derbyshire, keeps prices very low. For best screened Wigan Arley at the pit mouth prices remain at 10s. to 11s. per ton; and for common ditto, 8s. to 9s. per ton. Pemberton four-feet has now generally receded to the price ruling at the commencement of last month, and the average quotations are 8s. to 8s. 6d. per ton, with 6s. 6d. to 7s. per ton for common Wigan coal, suitable for house-fire purposes. Common coal for steam and forge purposes continues a complete drug, the demand for both home use and shipping purposes being extremely small, and this class of fuel is pushed upon the market by needy holders at such low figures that it is difficult to say at what price it could be bought. The average quotations at the pit mouth range from 5s. 6d. to 6s. 6d. per ton, and for shipping orders as low as 6s. 6d. to 7s. per ton has been taken for delivery at the High Level, Liverpool. The better sorts of engine fuel meet with a moderate demand, and prices are generally steady at from 5s. to 5s. 6d. for good burgy, and 3s. to 4s. per ton for good ordinary slack; but the common sorts are difficult to move almost at any price.

In the iron trade there is still very little doing, and not half the plant of the district is at present being employed in the production of either raw or finished iron, whilst in the engineering trades most of the large establishments are running short time. Local makers of pig iron are unable to compete with the extraordinarily low prices at which outside brands are now being offered here; whilst amongst finished iron makers the present very unsatisfactory position of trade has brought about an effort to arrange some uniform basis for prices, so as to prevent the ruinous competition which is at present going on, and it is probable also that the wages question may be again taken into consideration. Local quotations for delivery into the Manchester district remain at 51s. per ton for No. 3 foundry, and 50s. per ton for No. 4 forge pig iron, less 2½ per cent., and 46 7s. to 46 7s. per ton for bars.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

As might have been anticipated from the state of the public mind all over the country, the extremely unsatisfactory and changing nature of the intelligence which was received from the East last week, and which at one time threatened to precipitate England into war, had a most disturbing effect upon the coal trade of the North of England. The news of the armistice, which was made known on Monday, caused a good deal of activity on Newcastle Quayside, and a considerable amount of business was likely to have been transacted for the Black Sea. But when merchants commenced to communicate with their correspondents at Odessa and at Constantinople, they could get no replies to their communications. That put a stop to speculation. The wires seem to have been cut, or something done to them. Then followed the rumours of the march of the Russians into Constantinople, which, of course, was subsequently contradicted, and when the trade got through these rumours and turmoils, the week was far spent. But, as it was known that Odessa was very much in need of coals, some cargoes of gas coals were shipped by steamer and despatched, and it is quite probable that this week a great deal more business will be done in that direction in the way of coal shipments. Very little contracting has yet been entered upon by the Gas Companies in the Baltic. They feel inclined to hold back, in hopes that gas coals may be lower than they now are. The contracts that are being made, however, for other places are at about the figure mentioned last week—namely, 7s. 6d. per ton. Most of the home contracts have been made. The best gas collieries are working full time, but business at the second-class pits in Durham is very indifferent. It cannot be roused into any sort of life. The strike in the Northumberland steam coal trade has produced no effect upon it, certainly not in the way of improved prices. The strike is wearing itself out. The men have no resources, and they will have to accept the reduction of 12½ per cent. upon their wages. It is almost certain that the pits will be at work by the middle of this week.

Coasting freights advanced about 2d. per ton last week. This was owing to the detention of small sailing vessels on their passage to the North. Steamers freights would have a corresponding rise. On account of the desire of steamers to get out to Odessa as soon as the blockade is raised, rates to the Mediterranean and Black Sea are low, £13 per keel only is paid steamers to carry coals to Odessa. The gas-works in Odessa, it is reported, have been quite out of coal for a long time, and the streets of the town have been nearly in darkness, so that the needs of the Gas



Company there are pretty considerable. More gas coals were shipped last week for Boston, U.S.; the freight was 5s. 6d. per ton.

Of course, in the unsettled condition of business last week very little manufacturing trade was entered upon. The chemical market was, if anything, flatter, but it is hoped, now that things look more settled in the East, and that there is a better tone of trade in America, the chemical business will rally a little. It has been in a very depressed condition over a considerable period. The state of the iron trade is unchanged, but there may be a considerable improvement within a month or two if peace be established. Manufacturers are clinging to that hope.

A large number of sailors got to sea last week—some 400 or 500, as a good few steamers took crews to the Mediterranean. The labour market has been cleared to that extent, and as most of the Northumberland miners will be at work, it is hoped in a few days the position of a large body of the working population will be much improved.

#### TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The Sheriff of Dumbartonshire has now pronounced an interlocutor approving of the whole proceedings taken by the Police Commissioners of Kirkintilloch in regard to the adoption of the Burghs Gas Supply Act, and authorizing the registration of their minutes, on the subject, in the Sheriff Court books. The effect of this proceeding is that the Act is now finally adopted within the burgh, and that the Commissioners of Police are the statutory authority for carrying out its provisions.

At Burntisland the same steps have been taken in that burgh, and the Sheriff of Fifeshire has confirmed the act of the Town Council of Burntisland in respect of the Gas Act. In this case the existing works belong to the North British Railway Company.

The Directors of the Gas Company of Kilmalcolm, a rapidly rising village on the high-level line of railway leading from Glasgow to Greenock, and now becoming an important residential suburb of Glasgow, have reduced the price of gas from 9s. 9d. to 9s. 2d. per 1000 cubic feet; and a dividend of 3 per cent. has been declared for the financial year just expired. It is rumoured that the Glasgow and South-Western Railway Company have approached the Gas Company with a view to the purchase of the works and plant; but it is stated that as yet the negotiations have not been successful. With the view of providing additional street-lamps in the village, a public subscription is being raised.

At a meeting of the Glasgow Town Council last week, confirmation was given to a minute empowering the Gas Commissioners to sell, to the City Improvement Trustees, the property which was formerly the site of the Townhead Gas-Works, at the price of £35,794, entry to be had at Whitsunday next. There is at present under notice of motion, before the Gas Sub-Committee, on Works, a proposal to close the Partick Gas-Works as early as possible, and to dispose of the ground and materials.

In his report upon the quality of the Glasgow gas for the week ending the 2nd of February, Dr. Wallace reports that the minimum illuminating power ranged from 25.70 to 26.26 candles; the average from 26.06 to 27.05 candles; and the maximum from 26.39 to 27.71 candles.

At the usual meeting of the Edinburgh Town Council, held last Tuesday, there was submitted Mr. J. F. King's report on the analysis of the gas supplied to the city on the 28th of January. The gas of the Edinburgh Company was stated to possess an illuminating power of 28.30 standard candles, and that of the Leith Company stood at 27.50 candles. Mr. Somerville moved that, in view of the fact that the gas for the public lamps was taken from the pipes of both Companies, it be remitted to the Cleaning and Lighting Committee to consider the whole question of the gas supply. The motion was agreed to.

On the 1st inst. Glasgow Corporation Gas Nine per Cent. Annuities were 10s. higher, at 218.218, and a small lot realized the advanced quotation.

The usual monthly meeting of the Dundee Water Commissioners was held last Thursday, when it was reported that, at a meeting of the Works Committee, held on the 31st ult., it was resolved to pay the contractors for the Lintrathen Water-Works the sum of £13,439 5s. 11d., being the balance due to them by the Commissioners.

On Saturday, the 2nd inst., the completion of an important new water supply scheme for the parish of New Cumnock, Ayrshire, was celebrated. The works were executed under the superintendence of Mr. Wyld, from the office of Messrs. A. and J. Leslie, of Edinburgh.

Owing to the prevalence of epidemic disease a short time ago in the town of Airdrie, the water with which that town, the neighbouring town of Coatbridge, and Langloan are supplied was suspected, and already Mr. Tatlock, of Glasgow, and Dr. Stevenson Macadam, of Edinburgh, have subjected it to analysis. Dr. Macadam says that though the waters cannot be regarded as the best for town use, yet they are a good average quality; and there is an absence of those unwholesome ingredients which confer noxious or unhealthy properties upon water. He is, therefore, of opinion that, at the time of his inspection, the water supply of the districts named was of wholesome character, and fitted for all domestic purposes, including drinking and the cooking of food.

The recent rapid advance in the price of pig iron in the Glasgow market culminated on Monday last, when a violent reaction set in, the highest prices reached being 52s. 4d. cash, and 52s. 5d. one month. A decline of 6d. per ton took place on Tuesday, and on the following day there was another decline of 5d. per ton, which was reduced to 4d. before the close, the total decline being 1s. 1d. from Monday's highest quotation, and the closing prices for the week being 51s. 2½d. cash, and 51s. 4d. one month. About 5000 tons changed hands on Monday forenoon at 51s. 2d. cash.

There has been an exceptional dulness in the Glasgow coal market during the past week, the result, to some extent, of the insufficiency of vessels in port, as well as the general want of confidence in political affairs. Prices are a shade easier. A good many of the coalmasters experience considerable difficulty in keeping their pits going.

**PONTEFRAC GAS COMPANY.**—The report of the Directors to be presented to the half-yearly meeting of Proprietors, on the 20th inst., states that the amount divisible amongst the Shareholders is £1300 17s. 11d., out of which they recommend the payment of a dividend for the six months ending Dec. 31 last, at the rate of 10 per cent. per annum. The whole of the plant is in an efficient state, and good working order.

**CROFT GAS COMPANY.**—The half-yearly meeting was held at Darlington, on the 4th inst.—Mr. G. J. Scurfield in the chair. The Directors reported a profit on the six months working of £184, which enabled them to recommend a dividend at the rate of 6 per cent. per annum. The affairs of the Company were progressing, and, during the period under review, an additional bench of retorts and a set of annular condensers and scrubbers had been erected.

**STOCKTON AND MIDDLESBROUGH WATER COMPANY.**—The half-yearly meeting of the Shareholders was held on the 5th inst.—Mr. H. Pease in the chair. The usual dividend was declared at the rate of 10 per cent. on the original and class A shares; 8 per cent. on class B and D shares; and 5 per cent. on the C and E preference shares. The Chairman stated, in answer to inquiries, that, when the purchase-money payable by the Corporation was received, it would be immediately distributed.

**SALES OF PROVINCIAL GAS AND WATER SHARES.**—Last week twenty £10 ten per cent. shares in the Belper Gas and Coke Company were put up for sale by auction, and realized £19 each; and six £5 shares in the same Company were sold at par, as were also twenty-eight £5 shares in the Matlock Water-Works Company. On the 1st inst. £120 consolidated stock in the Cambridge Water-Works Company was sold by auction, and realized £273; and at the same time 117 £2 shares in the same Company, upon which 10s. per share has been paid, sold for £265.

**WHITWORTH VALE GAS COMPANY.**—The report of the Directors shows that, though there was an increase during the last half year of thirty in the number of consumers, in gas-rental there was a decrease of £822 6s. 1d., as compared with the corresponding period of 1876, the figures being £2139 7s. 1d., as against £2961 15s. 2d. This decrease was, no doubt, owing to the short time being worked in the district, and the general depression in trade. Nevertheless the accounts show a profit of £913 8s. 7d. on the half-year's working, which, with a balance held over from the last half year, will allow a dividend at the rate of 10 per cent. per annum, and leave a considerable surplus to be carried to the next account.

**REDUCTIONS IN THE PRICE OF GAS.**—The Directors of the Worcester Gas Company have announced that on and after the 1st of July next the rate of reduction for prompt payment of accounts will be 9d., instead of 6d., per 1000 cubic feet, as at present. The Croft Gas Company have made a reduction of 6d. per 1000. At Chippenham the price is reduced from 4s. 7d. to 4s. 2d. The Directors of the Sleaford Company have determined to reduce their price from 5s. to 4s. 7d. on the 1st of April next. The Directors of the Sheppy Gas Company announce a reduction from 4s. 6d. to 4s. 3d. on and after the 1st of July, with a corresponding reduction on the charge for public lighting. The Dewsbury Town Council propose to make a reduction of 6d. per 1000 very shortly.

**SHEERNESS PUBLIC LIGHTING.**—The Local Board of Health for Sheerness having applied to the Sheppy Gas Company for a reduction in the charge made by them for the public lamps, the Secretary of the Company (Mr. A. W. Marks) has made the following reply, which was laid before a meeting of the Board on Thursday last:—

Gas Office, Feb. 6, 1878.

Gentlemen,—The Committee of Directors having reported the result of their recent interview with your General Purposes Committee, I am instructed by the Board of Directors of this Company to say that they have fully considered the representations then made, and they cannot find that any legitimate grounds were shown for the concession of a special rate of charge for gas supplied to the street-lamps. The principle of a uniform charge, both to public authorities and private consumers, is one which, so far as they can ascertain by inquiry, is not departed from in any place where the street-lamps are supplied by "average meters." As was explained to your Committee, the gross quantity of gas supplied to the public lamps is a quantity very disproportionate to that supplied under either of the special contracts of the Company.

The Directors have arranged, in the ordinary course of their business as defined by Act of Parliament, and as an additional incentive to the still more extended use of gas, to offer a further reduction in the price of gas from and after July next, in the shape of a discount for prompt payment, of 3d. off the present rate of 4s. 6d. per 1000 feet, throughout their district. In such reduction your Board will participate.

The principle for which your Committee contended, that some advantage in price should be granted in respect of the supply of the public lamps, is one which, in the estimation of the Directors, would involve an injustice to every private consumer, especially the larger ones. The conditions upon which the lamps are now supplied involve incidental risks, and well-ascertained losses, far in excess of the average in private consumption, so that the same gross rental from ordinary consumers, who are constantly increasing in number, is very much more profitable to the Company.

Under these circumstances, the Directors regret they cannot admit that any fair claim has yet been made out for an exceptional reduction in the price of gas supplied to the public lamps. (Signed) A. W. MARKS, Secretary.

**NEWPORT (MON.) GAS-WORKS BENEFIT SOCIETY.**—The annual dinner was held on the 28th ult.—Mr. T. Canning, the Engineer of the Gas Company and the Treasurer of the Society, occupying the chair. In the course of the evening, responding to the toast of "Prosperity to the Society," the Chairman said the objects it contemplated were very simple indeed. About Midsummer, 1875, one of their poor fellows died in circumstances well known to them all. He would refer to them no further than to say it was the origin of the Society. They buried him in a very decent and proper manner. The day that he was buried this Society was born. He hoped the Society would improve by age. It had reached its third year successfully and prosperously. There was only one fact that he regretted to mention in connection with it. Since their first meeting in public they had lost two members who were with them then. The Society originated among themselves, was maintained by themselves, and was carried on entirely by themselves, and none but themselves interfered in any way whatever in its management. They had donations from the Directors of the Gas Company and others, and with that assistance they managed all the rest themselves. During the three years there had been £134 collected. Considering the small number of men, this was a strong testimony to their care and thrifty habits. During that time two members had died, two members wives had died, and two children; and these had been properly and decently interred. They had also aided a great many amongst them who had been sick. There was in the bank a balance of over £26 in their favour; and three dividends had been paid. It did not need anything more than these facts to testify to the success and fidelity of the Society. Some excellent speeches were made in the course of the evening, and a very agreeable entertainment appears to have been enjoyed.

#### Register of New Patents.

##### APPLICATIONS FOR LETTERS PATENT.

- 422.—EASTMURE, D. G., Kentish Town, London, "Improvement in the construction of ball-valves." Feb. 1, 1878.
- 433.—SIMON, L. and R., Nottingham, "Improvements in and connected with gas-engines." Feb. 1, 1878.
- 443.—LEE, J., Dublin, "Improvements in the manufacture of gas from wood, peat, or other vegetable substances, and in apparatus employed therefor." A communication. Feb. 2, 1878.
- 445.—LEESON, W. R., Bridgewater, Somerset, "An improvement in adjustable spanners or wrenches, also applicable as a nut-lock." Feb. 2, 1878.
- 451.—VAUGHAN, E. P. H., Chancery Lane, London, "Improvements in apparatus for raising water." A communication. Feb. 4, 1878.
- 453.—WEST, J., Maidstone, "Improvements in apparatus for charging gas-retorts." Feb. 4, 1878.
- 464.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in valves or apparatus for reducing or regulating pressure." A communication. Feb. 5, 1878.

##### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 2944.—FATHERS, J., Wales, Yorks, "Improvements in water, steam, air, and other similar valves or cocks, the said improvements having reference to the spindles, covers, and packing thereof." Aug. 1, 1877.
- 3011.—CONRADT, H., Golden Square, London, "An improved universal syphon pump." A communication. Aug. 8, 1877.
- 3051.—RICHARDIN, C. H., Paris, "Improvements in gaseliers and other pendent lights." Aug. 10, 1877.



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## THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 19, 1878.

### Circular to Gas Companies.

THE great event of the past week, as concerns our industry, was, of course, the half-yearly meeting of The Gaslight and Coke Company. To this vast undertaking every one turns with constantly increasing interest. It is the largest gas concern in the world, and regarded from any point of view, it must be looked at with something like wonder. Having given, last week, an analysis of the accounts, we need only to-day follow the Governor through his admirable epitome of the state of affairs. First, let us state that we look with some regret on his reference to the proceedings taken by the Metropolitan Board of Works. Those proceedings, in our opinion, should have been dismissed with utter contempt. The fine was of no consequence whatever; but what we may fairly call the insult to the Company, was gross. There is, probably, no other corporate body in the world who would have behaved like the Metropolitan Board. We do not, for the moment, trouble ourselves about the cause of the deficiency of illuminating power (it was probably occasioned by a sudden deposition of naphthaline); but we may repeat here the statement of the Governor, verified, of course, by the reports of the Official Gas Examiner, that for seven years the Company have supplied gas considerably in excess of, and of a quality far superior to, that required by statute. That the Company should be prosecuted for one day's default, can only be quoted as an example of malignity. And yet we are sorry that the Governor of the Chartered Company referred to it at so much length; it was treating the Board with too much honour.

We commended last week the policy of the Directors in carrying forward a large balance, instead of paying an increased dividend. The justice of this policy is well explained in the Governor's speech. In the course of the next two years the convertible five per cent. shares will, if the proprietors choose, become entitled to ten per cent., and this will naturally absorb an increased amount of profits. We mentioned a fact which came to our ears, that a section of Shareholders, whose motto, perhaps, is "*Carpe diem*," would have preferred an enhanced dividend; but the course which the Directors have pursued is infinitely preferable, and more just to the general body of Shareholders. The addition to the reserve-fund was, we may say, made of necessity, and it is only to be regretted that the law does not allow of larger annual contributions to it. Before the sliding scale was enacted, it might have been well to fix a limit to the amount of profit which should be carried to the reserve-fund; but, under present circumstances, no restrictions are necessary, and as the Company have the legal right to an unlimited reserve, the annual contribution to it might have been

unlimited also. We need hardly say that we entirely endorse the policy of the Directors.

By a rather violent transition, the Governor immediately passes on to a consideration of the charges which have been brought against the Company, of nuisance at the Bromley works, and gives us the satisfactory announcement that a method has been discovered of treating foul lime, so that it may not be a source of *désagrément*. It has been repeatedly shown in our pages that foul lime need not be a nuisance for one moment, and, further, that it may be revived for repeated use. The Governor hopes that the use of lime in purification may soon be entirely abolished. We share his wishes, but cannot for the moment share his hopes. Rumours of new methods of purification, which will reduce the amount of sulphur to almost nothing, have reached our ears for months past, but the process is a mystery. We do not believe in mysteries. There is, we understand, a patent concerned, and, no matter who the patentee may be, we have an equal objection to secret processes. The Governor, very properly, dilates on the expenses incurred by the Company in disputing Mr. Patterson's patent rights. We shall not here add anything to what we have said with regard to Mr. Patterson's alleged discoveries, but may express a fervent hope that, somehow or other, a more effectual method of purification than that gentleman proposed may have been stumbled upon. One thing is gratifying, and that is that the Company seem to have become alive to the fact that sulphur is an obnoxious ingredient in gas; and, further, that its removal is not a difficult matter. Let them continue the course they have begun, and we care not how the result is effected, so long as the sulphur is removed as much as possible.

When referring last week to the reduced cost of purification, we remarked that we should be glad to know how the saving had been effected. We learn now that it has arisen mainly from two causes—first, from the fact that the Company manufacture their own lime at Beckton, not only for that, but also for some of their other stations; and, secondly, from the circumstance that spent oxide, as is well known, has realized a higher price during the period over which the present accounts extend.

The interest which the Governor takes in the affairs of the Company is well illustrated by his visit to Paris to see the electric light. Unless we are misinformed, he might have seen better and cheaper electric lights in England. The light he saw in Paris, produced by a rapid succession of sparks, is, we believe, even more expensive than Jablochhoff's candle, although, perhaps, more regularly sustained. Unless we are mistaken, it involves the use of a powerful Rhumkorff coil, and for that reason is less adapted for domestic lighting than the carbon candles, which have been used by other inventors.

We went so fully last week into the working of the Company, that we have nothing to add now but another complimentary remark on the management. It is perfectly clear that the Company are excellently well served by their officers, and this good management, combined with favourable coal contracts, will make the Company a mine of wealth. Supposing everything to go well, within three years the sliding scale may be brought into operation in favour of the Shareholders. The electric light is at present a phantom, and we may safely predict that, under the present condition of the commercial world, the Chartered Company's shares will go on increasing in value. The announcement is made that the Directors are about to raise, by the creation and issue of debenture stock, the sum of £125,000 at four per cent. This, we believe, exhausts the borrowing powers of the Company up to the Act of 1876. The issue will, no doubt, attract the attention of the Proprietors, for it is hard to gain in these days four per cent. interest for capital. When the new share capital authorized by the Act of 1876 is offered by public auction (unjust as we may think the proceeding to be), we venture to think that the interest of existing Shareholders will be so far protected that no doubts can be had as to the security of their profits. They may be a little reduced, but, supposing the condition of things in the commercial world to remain as they are, the reduction will be but small; that is to say, nothing more than four and three-quarters per cent. can be expected. Happy, indeed, are the possessors of original shares in Gas Companies.

We have so often recommended the Chartered Company to work up their own residual products, that we are quite prepared to encounter, in our irresponsible way, any opposition to the scheme. That the Company will profit in the long run there can be no doubt whatever. We shall be extremely sorry if the works of the Company in the least detract from the profits of private manufacturers; but we, as circumstanced, are bound to consider as pre-eminent the interests of Gas Companies. They are well able, however, to take care of themselves, and we need not waste further space in their support. The Governor is per-



fectly correct in characterizing the Beckton works as at present the finest in the world. We need not speak of the past. The future of the Chartered Company is so well assured, that we do not hesitate to recommend the Shareholders to adhere strictly to their securities.

The London Gaslight Company have arrived at the sensible decision to discontinue, at the end of the present half year, the supply of cannel gas. The demand they have for it is but small, and what they distribute has been for years bought in bulk.

The Town Council of Warrington are congratulating themselves on the purchase of the gas undertaking. They expect to make £3000 this year—that is, they intend to plunder the consumers to that extent. It is no new thing in these columns to offer an opinion, that Municipal commercial undertakings should be simply self-remunerative. If the gas consumers of Warrington care to pay extra taxes, we have no objection to make; but they ought fully to understand, that every penny they pay for gas beyond what is required to meet the interest on the debt incurred by the Corporation, and the cost of manufacture and distribution, is, we will not say robbery, but something very like it.

The Peterborough Gas Company maintain their ground, and are happily in a very prosperous condition. Nobody assails them now, and they have a fair prospect before them. In the last half year they carbonized 2434 tons of coal, and got from it 25,769,000 cubic feet of gas, which is equivalent to 10,580 cubic feet per ton—a most excellent result. Of this quantity, 22,990,000 cubic feet were sold, the difference being equal to only ten and a half per cent. loss, which, considering the condition of Peterborough, is remarkable. The loss is less by two per cent. than in the preceding year. Wages, too, have been reduced to a considerable extent, and, altogether, it must be estimated that the works are in a most flourishing condition.

The Annual Meeting of the Cork Gas Company was held on the 11th inst. The Company have had a fair year's working. They are able to pay a dividend of eight per cent. for the last year, and also one per cent. for arrears, to make up for losses during the disastrous period of 1873. The Company are rapidly reducing their price, and the reduction effected this year will give the consumers the benefit of £2000. Our readers may be certain that nothing will be wanted to make the Cork Gas Company a very successful undertaking. The demands upon our space to-day oblige us to defer the publication of the report and accounts until next week.

We have lately had occasion to refer to many reductions in the price of gas, and now we have to mention an advance. The Dawley Gas Company have added tenpence per thousand to their charge, and have thereby excited the lively animosity of their customers, a number of whom have signed an agreement to cease consuming gas until the price is reduced. Perhaps the Directors may think it worth while to consult the wishes of the Consumers as well as the interest of the Shareholders, and, as the former propose, split the difference.

A meeting of Ratepayers of Exeter, convened in accordance with the provisions of the Borough Funds Act, has sanctioned the opposition of the Corporation to the Bill of the Exeter Gas Company. It is clear that the Exeter people are a saving class, for a resolution was afterwards put and carried, that negotiations should be opened with the Company to see if clauses could not be settled in Exeter, so as to save the expense of sending the Mayor, one or two Aldermen, the Town Clerk, and the City Solicitor, to London for a week's holiday at the public cost.

### Water and Sanitary Notes.

THE wire-pullers have been at work, but why they should have made a puppet of H.R.H. the Prince of Wales, we fail to conjecture. That the water supply of the country, and especially in rural districts, requires improvement, there can be no doubt; but how it can be improved by a three or four days discussion in the Adelphi, is not clear. Nothing, we rather think, ever did come of a flood of talk emitted in that locality. The quacks meet once more, ventilate their opinions, have them printed in the Society's *Journal*, which, as a rule, is consigned to the waste paper basket, and all is over. Nevertheless, we confess that something will soon have to be done. The water resources of this country may be said to be largely in excess of the requirements of the population, but they need to be properly administered, which they are not at present. If, as His Royal Highness suggests, a large and comprehensive scheme of a national character, adapted to the varying specialities and wants of districts, could be concocted and carried out, it might be that some good would be done. The intervention of the State in

the matter, however, is out of the question; and local jealousies will naturally interfere to prevent the appropriation of local sources for the benefit of outsiders. We see this in the opposition now being made, by the millowners and others in the chalk districts around London, to the proposition of the Metropolitan Board of Works. In a modified form, we see it also in the conduct of those who oppose the Thirlmere Scheme of the Manchester Corporation. What ideas prompted the letter dictated to the Prince of Wales, we have no means of knowing. Most probably, the only thought was to get up some talk to sustain the waning popularity of the Society of Arts.

The Manchester Corporation Water Bill has been read a second time in the House of Commons, and referred to a hybrid Committee, consisting of nine Members. The opposition to the measure, all must admit, was weak in the extreme, and but for the intervention of the Government, the second reading would probably have been carried triumphantly, and the Bill, as a matter of course, would have gone to a Select Committee. We do not, however, much regret the result which has been arrived at. The more the question is looked into, and the wider the view taken of it, the more convinced are we that the claims of Manchester, and other large towns in the North, to the waters contained in the natural reservoirs of the Lakes will be admitted. How far a wider appropriation may be made will be matter which this Committee may justly consider. We do not wish to see the water brought to London, for we confess we dislike it. We greatly prefer unsoftened chalk water, and, still more, the softer supply obtained from the Thames and Lea; but the water quacks are very active, and what with the investigations by this Committee, and the babble at the Society of Arts, we shall have enough to listen to on the water question for the next few months.

Dr. Frankland is greatly exerting himself to back up the chalk water scheme of the Metropolitan Board of Works. His quixotic attempt is not likely to meet with any success. His reiterated statement that water which does nobody any harm is quite unfit for dietetic purposes, now only excites laughter. The assertion did once produce alarm, but, like the cry of "Wolf, wolf!" when that ugly quadruped was absent, the statement has ceased to create any sensation. The fact is recognized, that people can continue to drink Thames and Lea waters and live, and the drinkers of Kent and Tottenham waters die just as fast as their neighbours—in one case, indeed, rather faster.

The Metropolitan Board, the majority of whom decline to be regarded as Vestry delegates, nevertheless pretend to act for the Vestries, and in the water dispute now going on they are endeavouring to deprive their constituents of *locus standi* in Parliament, in opposition to their schemes. Whether they can maintain their position or not remains to be seen, for the Vestries are preparing to stoutly contest the question. An important meeting of the representatives of Vestries met at St. Pancras on Friday last, and resolved to maintain the rights of the Vestries to be heard against the schemes of the Board. A great mistake has been made, and we think we discern the beginning of the end of the Metropolitan Board of Works. It is now made clear that they have not the confidence of the public, and without that their existence cannot be prolonged. The misfortune is that we have now no municipal statesman—no one with skill and energy to work into order the chaos of Metropolitan Local Authorities.

CONSUMPTION OF GAS IN LONDON.—During the year 1877, The Gaslight and Coke Company, who supply three-fourths of the Metropolitan area north of the Thames, manufactured 10,728,272 thousand feet of gas, a quantity sufficient to keep one street-lamp, consuming 5 cubic feet per hour, burning day and night for 244,938 years.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—The annual general meeting was held on Thursday last, the report of which will appear in our next.

BIRMINGHAM WATER SUPPLY.—Dr. Hill, the Medical Officer of Health for Birmingham, reports that the water supplied to the town during January was clear. The organic nitrogen, though higher than it had been for the last ten months, was lower than in the corresponding month of last year.

GAS AFFAIRS IN BARBADOES.—The *Barbadoes Globe* of the 24th of December last gives a long account of the Agricultural Society's Industrial Exhibition at Bridge Town, refers to "a display of gas-stoves and cooking apparatus," and to "samples of manures manufactured from the refuse of gas-works." "Within the bar (of the Court House), which was erected in one of the deserted cells, a gas-stove was at work furnishing the means of supplying hot joints and other material for luncheon." In the list of prizes awarded by the Council of the Society, we find that Mr. R. K. Moorhouse, the Resident Engineer of the Gas Company, received a prize of 15 dols. for "Exhibition of gas-stoves and specimens of sulphate of ammonia." The *Globe* of the 28th of December contains a letter from Mr. W. Drumm, Analytical Chemist, addressed to Mr. Moorhouse, in which he says: "I have pleasure in stating to you for the Directors, that all my testings, from July down to date, have shown for your credit a pure gas, always free from ammonia and sulphur, or its compounds, and invariably of high illuminating power, as judged by comparison of light, &c. I have in no instance detected the slightest trace of chemical impurities since my last report, and believe the public are satisfied that gas can be and is supplied to this city of full power and purity beyond any question."



## WATER BILLS FOR 1878.

(Continued from page 228.)

The *Nottingham Improvement Bill*, before alluded to, provides for the purchase of the Water-Works by the Corporation; but we believe there is some hitch in the matter.

The *Nottingham Water-Works Bill* is to extend the limits of the Nottingham Water-Works Company, and to authorize them to raise additional capital to the extent of £150,000, carrying the usual borrowing powers.

The *Scarborough Water-Works Bill*, and the *Scarborough Corporation Water-Works Bill*, are two competing measures relating, as a matter of course, to the water supply of Scarborough. As we announced last week, the two contending parties have arrived at an amicable settlement for the transfer of the works to the Corporation, and no notice of these measures is required. We have not yet learned the terms of purchase, but we may remark that the expended capital of the Company is £65,000, and they have borrowed £17,100, all of which has been expended. The Corporation, by their Bill, seek power to raise £250,000, which looks as though very satisfactory terms of purchase have been made. There is not, perhaps, a more promising undertaking in the kingdom, and the Corporation should deal liberally with the Company.

The *Sevenoaks Water Bill* is to dissolve and re-incorporate, with statutory powers, the Sevenoaks Water-Works Company. The original capital of the Company was £12,000, and they have borrowed £2500, and the estimated value of the Company is now £16,000, a sum it is intended to convert into stock. The Bill further proposes to raise additional capital to the amount of £12,000, making the total capital £28,000.

The *South Hants Water-Works Bill* is to extend the limits of the South Hants Water-Works Company, incorporated in 1876 for the supply of Romsey and the surrounding districts. The capital sanctioned in 1876 was £50,000, with the usual power to borrow. This Bill proposes to raise additional capital to the amount of £30,000, with the ordinary borrowing power.

The *South London (Spring) Water Bill* looks very much like a filibustering measure, designed to damage the interests mainly of the Southwark and Vauxhall Company. It has no chance of success, and may here be dismissed with contempt. The interested promoters may pay their parliamentary expenses, and look as pleasant as they can. Their design is, if they can get parliamentary permission, to supply "pure spring water" to a large district lying between Penge and Esher. The modest capital of £300,000 is asked for. At this day it is difficult to find a profitable investment, and supposing this Bill should pass into an Act—a very improbable contingency—people who put their money in the undertaking must take their chance. The promoters are the owners of a well and springs at Streatham, of the capacity of which we know nothing.

The *Southport Water-Works Bill* is to extend the limits of the Southport Water-Works Company, and to enable them to raise additional capital. The present capital of the Company is £150,000, all of which has been raised and expended, and their borrowing powers have been fully exercised. Naturally, in a growing place like Southport, the water-works require extension, and the Company having acquired land for new works desire to raise additional capital for their construction. The amount they propose in this Bill is £200,000, carrying the usual borrowing power. The dividend on the new capital is seven or six per cent., according as it is raised by ordinary or preference shares. The Company ask the very reasonable power to charge the whole rateable value when any part of premises is supplied with water.

The *South Staffordshire Water-Works Bill* is to enable the Company to raise further capital, in order to supply the necessities of their extensive district. It will have been seen that an arrangement has been proposed, under which the Company will be enabled to lease a portion of their undertaking to the Police Commissioners of Burton-upon-Trent.

The *Stone Water Bill* is to incorporate a new Company formed to supply water to Stone, Meaford, and Oulton, and a few surrounding parishes. The capital proposed for the Company is £10,000, with the usual borrowing power. Authority is asked to charge the usual rates and extras.

The *Trowbridge Water Bill* is to extend the limits of the Trowbridge Water Company, and to enable them to construct additional works. The capital of the Company is £40,000, all of which has been raised and expended, and they have borrowed to the usual extent. By this Bill they seek power to raise additional capital to the amount of £30,000, and to borrow to the extent of one-fourth that sum. The profits of the Company are to be limited to seven or six per cent., according as the capital is raised by ordinary or preference shares.

The *Truro Water Bill* is to extend the time for the completion of water-works by the Truro Water Company.

The *Warrington Water-Works Bill* is to extend the limits of the Warrington Water-Works Company, and to enable them to raise further capital. The present capital of the Company is £75,000, all of which has been raised and expended. Under the provisions of this Bill the Company propose to raise additional capital to the amount of £160,000, with the usual borrowing powers.

The *Waterford Corporation Water and Improvement Bill* is to authorize the Corporation of Waterford to raise £15,000 for the completion of their water-works. The Corporation do not appear to have been successful in the management of their water undertaking, for by this Bill they seek power to levy water-rates, which, so far as we can see, have no limits.

The *West Houghton Local Board Bill* is to authorize the Local Authority of the district to construct water-works. As our readers know, the Board have just purchased the undertaking of the West Houghton Gas Company. The estimated cost of the water-works is £29,845, and the Local Board seek power to borrow £35,000. The rates proposed to be charged are as usual.

The *Weston-super-Mare Improvement Commissioners (Water Supply) Bill* is to authorize the Commissioners to purchase the undertaking of the Weston-super-Mare Water-Works Company, and to obtain extended limits. The expended capital of the Company is £22,350, and the consideration for the purchase is to be £65,000. The Commissioners seek power to borrow £90,000. The Bill is intended to authorize the Commissioners to charge considerably higher rates than those usually charged by Water Companies.

The *Whitehaven Union Water-Works Bill* is to authorize the Local Authority of the district to construct water-works at an estimated cost of £35,780. Power is sought to borrow £40,000. The Authorities propose to charge exactly the same rates that Companies usually do.

## A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLVIII.

PUBLIC LIGHTING (continued).

The ordinary rectangular shaped lamp, 14 inches square at the widest part, notwithstanding its faults, is the most useful and economical shape that can be adopted for general use. It has the advantage over all others in first cost, and it is easily cleaned and repaired.

The plan which is occasionally adopted of filling the upper part of the lamp with porcelain or other opaque substance, intended to reflect the light downwards, is a retrograde step, and is not to be recommended except under special circumstances. The first gas-lamps used were so constructed, and afterwards the glazed tops were introduced as an improvement, which they undoubtedly are, over the others. The glass panes, permitting the light to be cast upon the upper fronts of the adjacent buildings, are to be preferred in all respects, as the light which is thus reflected from the walls gives a cheerful appearance to the street; whilst, on the other hand, the opaque tops convey the impression of a gloomy canopy in close proximity overhead, rendered all the more sombre and distressing from the light underneath, which has a most depressing effect upon the mind. These remarks do not apply with equal force to lamps used in the lighting of country roads, although even here the reflecting tops referred to are of questionable utility.

The lanterns or lamps are best made of copper, tinned over. The hole in the bottom frame, to admit of the supply-pipe, should be three-fourths of an inch in diameter. The bottom square should be in two halves—one fixed, the other hinged on the outer edge, for raising and lowering in lighting the burner. These may be glazed in the ordinary way, and the movable half should be provided with stronger glass, and may be protected from damage by the lighting-rod, with copper wires, three-fourths of an inch apart, soldered across the bottom. On no account should the hinged flap be dispensed with, or allowed to remain open, as the flame is thus exposed to the action of the wind, causing it to flicker and oscillate, sacrificing a large proportion of the light, and risking its extinction.

In employing regulators, a carefully constructed lamp is more necessary than where no regulators are used; because the pressure at the point of consumption being reduced to the minimum in order to ensure the maximum amount of light the gas is capable of affording, the jet is more liable to be affected by draughts of wind, causing an unsteady and smoky flame.

The lamp frame should be made as narrow as is compatible with due strength, so as not to intercept the rays of light. The stand or supply pipe may be of three-eighths brass tube, and should be of such length as that the burner therein shall be opposite to the centre of the side panes. The vertical iron service-pipe should be securely wedged or otherwise fastened at the top of the column, to prevent vibration and the loosening of the pipe-joints.

An improved lamp of the ordinary and other patterns is made by Mr. W. Keen, and Messrs. D. Hulett and Co. respectively, dispensing



with the use of putty or other similar material in fixing the glass, which is secured by clips, or by hinged flaps and turn buttons. The chief advantages claimed for these are the immunity from breakage of the glass through frost, expansion, or contraction; the ease with which new squares, to replace broken ones, can be inserted by any inexperienced workman; the capability afforded of removing the glass when the frames require to be painted; and their cheapness and durability. The annexed engraving, fig. 19, shows one of Mr.

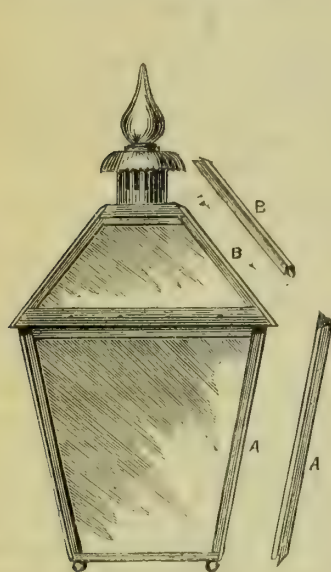


FIG. 19.

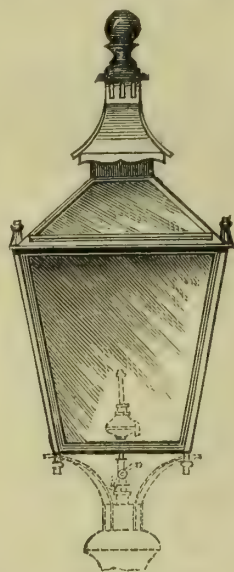


FIG. 20.

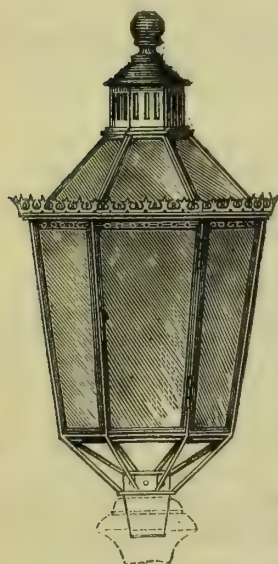


FIG. 21.

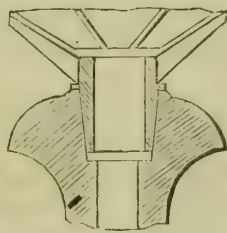


FIG. 22.

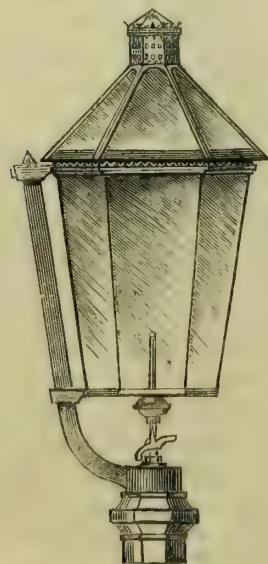


FIG. 23.

Keen's double-frame clip-lamps. They are glazed simply by the clips A and B. Different sizes and shapes of lamps, in copper, brass, and tin, are made on the same principle.

The 14-inch lantern, and the hexagonal pattern, called the "Westminster," as made by Mr. Sugg, are shown in figs. 20 and 21. The "Boulevard" (American) lamp is exhibited in fig. 22; and Mr. R. W. Brett's improved lantern, frame, and support, in fig. 23.

Each of these has its special merits, which need not be commented on, as they will be readily appreciated on an examination of the several engravings.

The utilization of the light given in street and other lamps has occupied the attention of Mr. T. A. Skelton for a number of years, and his efforts in this direction have been attended with deserved success.

The principle of Skelton's catoptric lamp is in the application of reflectors made of strips of silvered glass fixed in the roof and upper portion of the sides of the lantern, by which much of the light, hitherto dissipated by upward radiation, is bent down and utilized. The direction of the rays of light is by this means controlled, and, besides being better distributed, the rays are projected to such a distance in the direct line that, at a certain interval between the different lamps, the light-giving power of the flame is practically doubled, whilst at a still greater distance it is more than trebled. The effect produced by the use of these lamps upon the pathway has been aptly described as a continuous ribbon of light.

The lamps, as originally made, were fitted with a double set of reflectors—i.e., both on the roof and upper portion of the side panes, but a new pattern has been recently introduced, by which the reflector is applied to the roof only, thus reducing the extra cost of construction to one-half; and arrangements are also made by which the catoptric reflectors can be fitted into the lamps ordinarily in use.

Hitherto the reflectors have been made with silvered glass, the metallic back being protected by a coating of some substance. There was a liability, however, of the silver becoming oxidized on exposure to the air, in case of the failure of the preservative coating. To obviate this, Mr. Skelton has produced a non-oxidisable metallised glass, having a reflective power nearly equal to that of silver, requiring no protection whatever, and of perfect durability.

The metal frames, in which the different groups of reflecting strips are held, are glazed with ordinary glass on both sides, to prevent the entrance of dust and the tarnishing of the mirrors, so that lamps containing the reflectors are as easily cleaned as the ordinary kind. In the event of fracture or derangement of the mirrors, to which, however, they are not easily liable, the case containing them is readily opened, giving access for adjustment or repair. To prevent the glass surfaces from becoming obscured by damp, a perforated zinc cage, filled with lime or other absorbent of moisture, is placed between the glass coverings, and this can easily be removed and recharged at intervals as required.

The effect of the utilisation of light is to render street illumination much more efficient than it has hitherto been, and, as this is accomplished without an increased expenditure for gas, the economy is in proportion to the advantage gained, and far more than compensates for the additional cost of the improved lantern.

(To be continued.)

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### SUPPLY OF GAS TO PUBLIC LAMPS.

SIR,—Taking up the line of a paper read by me at Bristol, I beg to hand you results of the average meter system, with and without governors, in our town, for the quarters ending—

	Cubic Feet p. Quarter.
Dec. 25, 1877—	
Full-time lamps, with governors at 5 feet. . . . .	5,140
Dec. 25, 1876—	
Full time lamps, without governors. . . . .	2,550
	<hr/> 2,590
Dec. 25, 1877—	
Lamps put out at eleven o'clock, with governors. . . . .	2,290
Dec. 25, 1876—	
Lamps put out at eleven o'clock, without governors. . . . .	1,512
	<hr/> 778
Account for gas same time, with governors. . . . .	£123 6 6
Account for gas same time, without governors. . . . .	69 4 6
	<hr/> £54 2 0

I must here add that Brünner burners, to pass 4 cubic feet per hour, were in use before the 5 cubic feet governors, this apparently making the difference of one foot per hour; but the account fully shows that the loss on the old system must have been great; for, instead of being paid for 5 feet per hour as at present, we were only being paid for a little more than 2½, clearly proving that the average meter system without the governor is not just to the suppliers of gas.

Gas-Works, Hertford, Feb. 11, 1878.

R. W. BRETT.

### COMMISSIONS.

SIR,—A well-known Gas Engineer lately said to me that, although he himself refused commissions, he believed many who accept them justify themselves on the ground that their Directors or Committees know that they do so; and he mentioned one case he had heard of, where an applicant for increase of salary had been reminded that he had other means of increasing his income besides his salary.

Can any of your readers say whether it is correct to assume that Directors and Committees generally know of the practice, and approve of this mode of paying for services, otherwise (in too many instances) inadequately remunerated?

If it is the fact that the system is so known and approved, there seems no reason why it should meet with condemnation.

INQUIREE.



## LIGHTING BY ELECTRICITY.

(Concluded from page 193.)

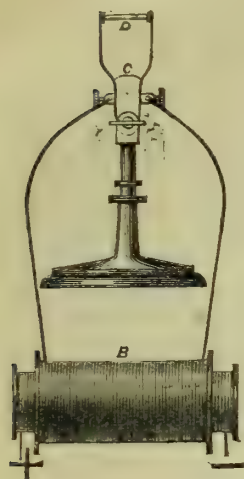


FIG. 18.

The last paragraph which we quoted from M. Fontaine's book, in which he expresses his fervent hope that the inventor of the Electric Candle may be "more fortunate than his predecessors" in giving practicability to the system of electric lighting, refers to one of M. Jablochhoff's latest attempts to solve the divisibility problem, as embodied and described in a patent which he took out in May last for "A New Process of Producing and Dividing Electric Light, and Apparatus therefor."

The only one we shall notice is of the incandescent type, in which, instead of platinum or carbon, he uses a piece of kaolin or porcelain, which, in consequence of the passage of the electric current, becomes incandescent, yielding light, at the same time consuming so slowly that many hours are required for its disappearance. He says:—

In carrying my invention into effect, I establish, in the electric circuit employed, a number of induction coils corresponding to the number of lamps to be employed, the terminals of each inner coil being connected to the said circuit, while the terminals of the outer coil are situated on each side of the slab of the kaolin of the lamp, such slab being held by the same description of vice or holder as described in the before-mentioned patent. In putting the lamp in action, the current of the induction coil is caused, in the first instance, to pass through a kind of conducting match, placed on the surface of the refractory slab. A spark being established along the line of this match, the heating and incandescence of the particles of kaolin along the same line is established, and the kaolin begins to consume away slowly while producing a brilliant light.

As any number of induction-coils may be placed in one and the same circuit, and as the circuit of each coil may be interrupted at several points for the establishment of as many separate lamps, it will be seen that a great number of lamps can be introduced into one and the same primary circuit, each of which can be extinguished or ignited without affecting the action of the others.\*

Fig. 18 shows the construction of my improved form of electric lamp. It consists of a vice, C, similar to that described in my previous patent for holding my electric candle, the jaws of the vice holding between them the blade or slab of kaolin or porcelain, D, which, with a width of about three-eighths of an inch, will burn all night. The vice is arranged above an induction coil, B, and may be enclosed by a lamp-glass or globe, the whole being made to resemble an ordinary lamp in appearance. The current from an induction coil, in passing through the slab, D, has not sufficient intensity to melt and burn the kaolin, but heats the same to the point of incandescence. The current is, in the first instance, made to act upon a kind of conducting match placed on the edge of the kaolin slab. The part of the slab which is thus heated forms a conducting line of great resistance, and which, on the passage of a current of high tension, is raised to a white heat, giving out a fine light. A certain consumption of the kaolin is effected along this line of incandescence, but the consumption is very small. The result thus obtained between the terminals of the circuit is a fine luminous band, which can attain a much greater length than the non-luminous spark ordinarily produced by the coil employed. The strength of the light only depends on the number of convolutions and size of the wire employed for the induction coil.

Fig. 19 shows the arrangement of my electric lamps for currents of the same direction, either continuous or reversed, such as are produced by Gramme's machine and ordinary batteries. In this case the induction coils are arranged with interruptor and condensers, either one to each, or, as the drawing shows, one to several coils. The induction coils, B<sup>1</sup>, B<sup>2</sup>, B<sup>3</sup>, are placed near the points where the light is to be produced, the lamps, which consist, as before, of a vice or clamp holding the kaolin slab, can be of different intensities, according to the dimensions of the slab, or preferably according to the number of slabs employed, the induction coils being made of correspondingly different dimensions.

We see that the improvement set forth in the patent just noticed is the obtaining of light by raising some refractory substance, by the electric current, to a white or glowing heat. In this case the current is to be that obtained from the secondary wire of an "induction coil," consequently, the lighting of a building by this system means, number of lights equal number of coils, plus one or more magneto or dynamo electric machines, according to the size of the premises, for exciting the coils. As all the readers of the JOURNAL know well what sort of an instrument the "induction coil" is, they will be able to judge for themselves what are the chances of success of such a complicated system of lighting, and what effect it is likely to have on their industry.

We have endeavoured to show what the electric light is, as used for lighthouses and large spaces, which, for the sake of distinction, we may call the voltaic arc lamp, with regulator. We have also described and illustrated the electric candle of M. Jablochhoff, which is intended (when some adjunct yet wanting has been found) to bring

\* But the same piece of kaolin cannot be relighted for want of the match.—Ed. J. G. L.

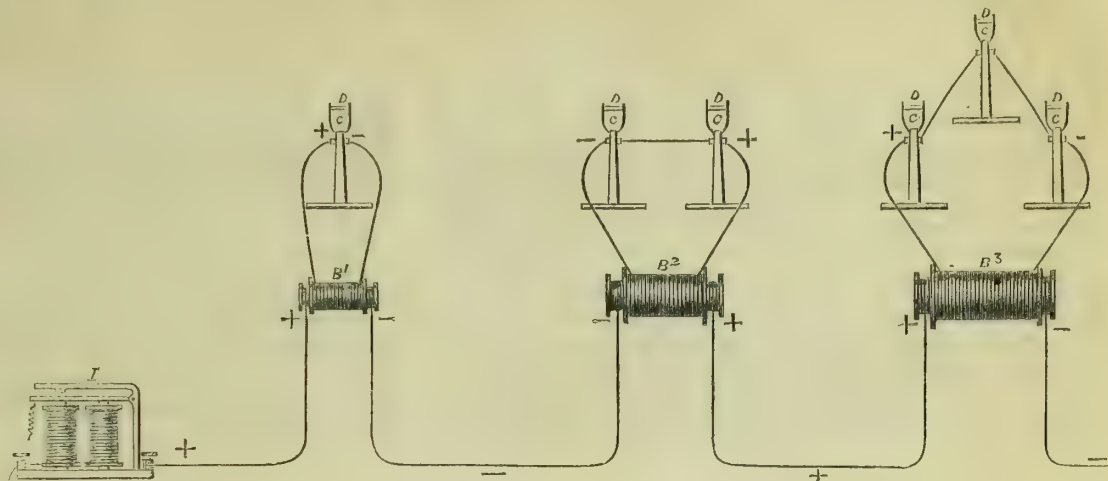


FIG. 19.

this light nearer home, and we may call it the voltaic arc light, without a regulator.

The notice of Mr. King's patent of 1845 introduces us to another type—the incandescent lamp. This is the prototype of all that class down to M. Fontaine's, of whose lamps we have at present only the likeness, as well as the kaolin lamp of M. Jablochhoff.

We have also called attention to a lamp of another type, first introduced by Mr. Thomas Wright, in 1845. In this the voltaic arc is also the source of light, but instead of carbon points, requiring great attention as regards their renewal, he suggested that carbon discs, revolved by clockwork, should be used, thereby obtaining light at the point where the edges are nearly in contact, and securing a greater duration of carbon material, without replacement. Many attempts have been made with a view to perfect Wright's idea; but in this particular, as in many others already mentioned, every step taken, as far as the lamps are concerned (except for a great centre of light), tends to a confusion of apparatus. Note the following as an illustration of our meaning: The annexed engraving, fig. 20, shows the latest improvement on Wright's invention, and is called the Regnier lamp. This is said to be equal to the supply of a light continuously, without a renewal of carbons, for 24 hours—i.e., supposing all things go well during the time. The discs or circular carbon plates touch nearly at A, and there the voltaic arc manifests itself in the form of what we now call the electric light, by reason of

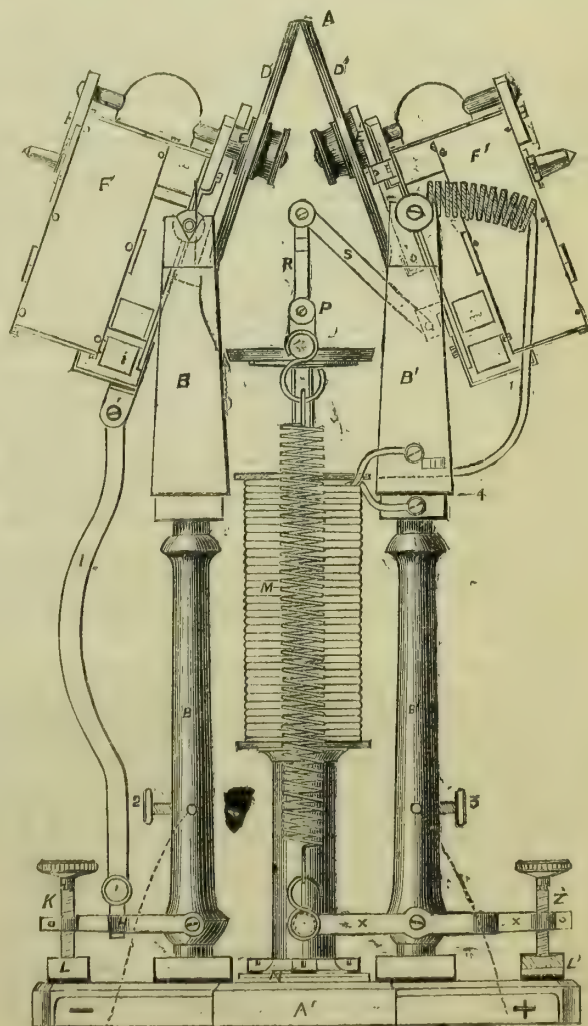


FIG. 20.



its action on the carbon, as before explained. A<sup>1</sup> is the base of the instrument, or, rather, machine. B B, B<sup>1</sup> B<sup>1</sup>, are standards forked at the upper ends. D D<sup>1</sup>, carbon discs, rotated by the clockwork contained in the boxes, F F<sup>1</sup>. G G are trunnions on which the discs and the clock-work motors oscillate. H is a forked lever, connected to the clock-work, F, by a curved rod, I. K is a set screw at the end of this lever, the end of which screw rests on the insulated cup, L. By means of this screw, the motor, F, can be moved forwards or backwards, for the purpose of adjusting the carbons. M is a coil in which is suspended a core of soft iron, which we shall see, by and by, acts as a regulator, in a similar manner to that of the regulators we have before heard so much of. The upper or forked part of the standard, B<sup>1</sup>, being insulated from the lower part at 4, the current passes up from the binding screw, 3, as far as this; but in order to pass this point to the forked end of the standard, it has to circulate around the wire of the coil, M, from whence it can get to the fork of B<sup>1</sup>, and the carbon disc, D<sup>1</sup>; cross over to D, down B B, to the binding screw, 2, and from thence to the negative conductor. By causing the current to pass through the coil, M, the soft iron core becomes more or less magnetized, and therefore through the medium of the rod, P, crank, R, and arm, S, increases or diminishes the breach between the two carbons, D and D<sup>1</sup>, according as the current is more or less intense. There are springs

attached to actuate the motor, F<sup>1</sup>, and disc, D<sup>1</sup>, in conjunction with the electro-magnet, M. X is a forked lever, to the forked end of which the springs are attached; at the other end is a set screw, Z, resting on the block, L<sup>1</sup>. By means of this screw the tension of the springs can be varied, and the lamp regulated. The battery wires are shown by dotted lines, and marked + and -.

The latest patent of M. Jablochhoff, the specification of which follows, is evidently intended by its title to embrace, or, at any rate, to appear to embrace, the substance shadowed forth in the remark by M. Fontaine already mentioned, which, to save trouble of reference, we will quote. He observes, with regard to the many schemes for lighting by electricity, and its division for lighting purposes, which have been patented or suggested from 1845 to the present time: "We believe that for such great efforts to be crowned with success, a new source of electricity would have to be discovered, or some means found of commercially utilizing atmospheric electricity."

M. Jablochhoff's patent, dated Oct. 17, 1877, and from which the accompanying engraving, fig. 21 is copied, is for "A New System of Distributing and Increasing with Atmospheric Electricity Currents proceeding from a Single Source of Electricity, for the purpose of Supplying several Lighting Centres." Let us see how he proceeds to do it:—

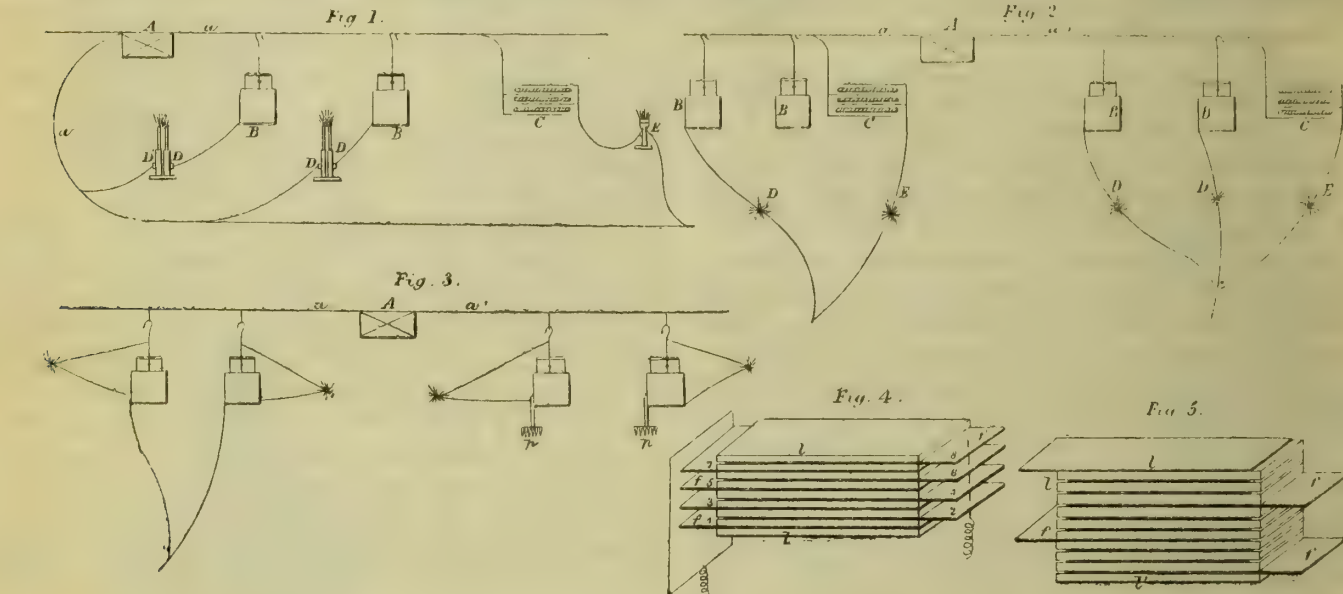


FIG. 21.

My invention has for its object to effect the distribution of electric currents proceeding from a single source of electricity, for the purpose of supplying at the same time a number of illuminating apparatus, and at the same time to strengthen such currents by means of atmospheric electricity.

In order to obtain useful results from a current proceeding from a source of dynamic electricity, instead of operating directly with the said currents, as heretofore, I, according to my present invention, cause the same to undergo a double transformation, by firstly converting the dynamic electricity into statical electricity, and then re-converting this into dynamic electricity, and it is by means of the latter current that I obtain useful results. For the above purpose, instead of closing the circuit of a source of electricity by means of a continuous conductor, as heretofore, I unite the conductor coming from one of the poles of the electrical source with one of the armatures of a condenser, composed of one or more Leyden jars of large surface, or constructed as will be presently described.

The other conductor is connected in various ways, of which the principal ones are shown on the accompanying drawings.

At fig. 1 the one conductor, *a*, proceeding from a magneto-electric machine, A (giving alternating currents), is connected with the interior surfaces of several Leyden jars, B, B, or of the condenser, C, which is of a particular construction. The outer armatures of these condensers are connected to one of the charcoal points, D, of my electric candle, or with one of the ends of the slab of kaolin E (operating as described in the specification to my former patent, No. 1996 of 1877). The other charcoal point, or the other end of the kaolin slab is connected to the second conductor, *a*<sup>1</sup>, of the electric machine.

At fig. 2 the two conductors, *a*, *a*<sup>1</sup>, proceeding from a magneto-electric machine, with alternating currents, are connected to the inner surfaces of the condensers, B, B, C, C. The outer armatures of these condensers are connected with the apparatus for producing light, of which the second charcoal point, D, or the other end of the kaolin slab, E, is connected with earth.

At fig. 3 the two conductors proceeding from the said machine are connected with the interior armatures of the condensers. The outer armatures, at the left hand of the machine A, are connected with earth, while at the right hand they are connected to pointed prongs, *p*, *p*, which allow more readily the escape of the electricity into the air. In this case the illuminating apparatus is placed between the inner and outer armatures.

The interposition of the condensers not only allows the current to be distributed in several directions as I have described; it also has the object of developing atmospheric electricity, and of accumulating it in the condensers, from which it is directed, in the form of currents, to the illuminating apparatus. The total quantity of electricity supplied to these apparatus is, therefore, greater than that supplied by the primitive current, and consequently produces a stronger light than that which the latter would give if led directly to the illuminating apparatus.

It will be evident that this electricity can, according as may be required, be supplied either in quantity or in tension.

Instead of Leyden jars it is more convenient to use as condensers those of the particular construction shown at figs. 4 and 5. That shown at fig. 4 consists of plates or layers of metal, *f*, *f*, separated by insulating slabs, *l*, *l*, the metal plates, Nos. 1, 3, 5, &c., and Nos. 2, 4, 6, &c., being respectively connected with each other. Each set of plates acts as one of the armatures of the Leyden jars.

For obtaining greater tension, the insulating layers are constructed of a number of alternate insulating and conducting leaves or plates, which are not in contact with one another, as shown at fig. 5.

The form of the condensers may be varied, and several may be connected in quantity or in tension.

Having thus described the nature of my invention, and in what manner the same is to be performed, I claim:—

1. The above-described method of distributing electric currents proceeding from a single source of electricity, for supplying illuminating apparatus, by first converting a current of dynamic electricity into statical electricity, and then re-converting it into dynamic electricity, which is conveyed to the illuminating apparatus.
2. The method of strengthening electric currents such as are referred to in the preceding claim by means of currents of atmospheric electricity, substantially as herein described.

Our readers, if they can discover nothing new, will soon recognize the old "Leyden jar" and M. Fizeau's "condenser," so much recommended, and generally placed in a cavity in the base of large induction coils. They may perhaps also be able to discover in what way M. Jablochhoff will be able to help himself from the great stock of atmospheric electricity, or how, from anything set forth in this specification, he manifests knowledge other than was possessed by the electricians of 1745. We cannot.

We have now completed the object with which we started, which was to give those of our readers who are curious on the subject the best account in our power of the means for producing the electric light, and what we consider the most intelligent speculations as to the probability of its becoming, at some time or other, a competitor with gas. In doing so we have, as far as possible, allowed discoverers and authors to speak for themselves. The volume of M. Hippolyte Fontaine, from which we have liberally quoted, gives a very interesting historical *résumé* of the efforts made by different inventors since the days of Mr. King, in 1845, to divide a stream of electricity in order to furnish several lights. We feel bound to say that these efforts have not been crowned with success, therefore the application of electricity for illuminating purposes is still greatly restricted. For public places and the illumination of large halls there may be a possible future for the electric light; but for illumination, in the ordinary sense, there can, as far as we can see, be none. Our readers will, however, draw their own conclusions from the descriptions we have given. All we can say is, let those who are so fortunate as to possess them, stick to their shares in the gas undertakings. Gas, as we have many times said, will last our time. We shall rejoice at any scientific progress made; but the instances in which advances of knowledge have destroyed an industry are exceedingly few, and, supposing the worst to happen, it will be a century or two before gas is replaced by electricity.



## Parliamentary Intelligence.

## HOUSE OF LORDS.

MONDAY, FEB. 11.

The Examiners reported that the further Standing Orders applicable to the York United Gas Bill have been complied with.

Bills read a second time:—Bedlington Local Board (Water); Castleford Local Board; Mansfield Commissioners Gas; Normanton Gas; York United Gas.

Petitions against the following Bills were presented:—Forfar Water, from (1) Caledonian Railway Company, (2) Manufacturers and traders in Forfar, John Lowson and Son, and others; Normanton Gas, from Henry Briggs, Son, and Co.; Warrington Water, from Trustees of the River Weaver Navigation.

TUESDAY, FEB. 12.

Bill read a second time:—South Staffordshire Water.

Petitions were presented against the Exeter Corporation Water Bill, from (1) Great Western and South Devon Railway Companies, (2) Exeter Water Company, (3) Topsham, Woodbury, and Lymington Water-Works Company; and against the Warrington Water Bill, from (1) Rev. Sir G. C. Schiffner, Bart., and Lady Shifner, (2) Newton-in-Mackerfield Improvement Commissioners.

THURSDAY, FEB. 14.

The Examiners reported that the further Standing Orders applicable to the Lichfield Gas and Trowbridge Water Bills have been complied with.

Bills read a second time:—Burton-upon-Trent Improvement Commissioners; Trowbridge Water.

Petitions against the following Bills were presented:—Castleford and Whitwood Gas, from (1) Lancashire and Yorkshire, and North-Eastern Railway Companies, (2) Ackworth, Featherstone, Purston, and Sharlston Gas Company, Limited, (3) Methley Local Board; Castleford Local Board, from (1) Whitwood Local Board, (2) Methley Local Board; Normanton Gas, from (1) Midland, Lancashire and Yorkshire, and North-Eastern Railway Companies, (2) Normanton Local Board, (3) Whitwood Local Board of Health; Warrington Water, from (1) Black Sluice Commissioners, (2) John Tattersall Cunliffe, (3) Samuel Beckett Chadwick, (4) Arthur Hugh Smith Barry; York United Gas, from (1) Corporation of York, (2) Trustees of York County Hospital.

FRIDAY, FEB. 15.

Bill read a second time:—Lichfield Gas.

Petitions against the following Bills were presented:—Castleford and Whitwood Gas, from (1) Normanton Gas and Water Company, Limited, (2) Whitwood Local Board, (3) W. J. and B. Mitchell; Exeter Gas, from Corporation of Exeter; Trowbridge Water, from Great Western Railway Company; Warrington Water, from (1) London and North-Western Railway Company, (2) Corporation of Warrington, (3) John F. Marsh, (4) J. and C. Hutchings.

## HOUSE OF COMMONS.

MONDAY, FEB. 11.

The Examiners reported that Standing Order 62 has been complied with in the case of the following Bills:—Cleveland Gas; Farnworth and Kearsley Gas; Shrewsbury Gas; Torquay Gas; and that Standing Order 63 has been complied with in the case of the East Grinstead Gas and Water Bill.

Bill read the first time, and ordered for second reading:—Drumcondra, Clonliffe, and Glasnevin Township.

Bills read a second time and committed:—Bangor Water and Gas; Cheltenham Corporation Water; Durham Water; Grand Junction Water; Hartlepool Gas and Water; Maryport Improvement; Nottingham Improvement, Gas, and Water; Scarborough Corporation Water; Scarborough Water; Sevenoaks Water; Tredegar Water and Gas.

Petitions in favour of the Manchester Corporation Water Bill were presented, from (1) Keswick Local Board, (2) Penrith Local Board, (3) Owners, &c., of houses and land at Windermere, &c., (4) Owners, &c., in Keswick, (5) Owners, &c., in Underskiddaw, &c., (6) Owners, &c., of Penrith, (7) Owners, &c., of Grasmere, (8) Landowners, &c., of Wythburn, &c., (9) Inhabitants, &c., of Ings and Staveley, (10) Hotel-keepers in the Lake District.

Petitions against the following Bills were presented:—Farnworth and Kearsley Gas, from (1) James Berry, (2) Farnworth Local Board, (3) London and North-Western Railway Company; Hamilton Burgh, from (1) Owners, &c., within Burgh of Hamilton and district proposed to be added, (2) Duke of Hamilton, (3) Commissioner of Supply of the county of Lanark, (4) John Urquhart, (5) John Cooper, (6) Bent Colliery Company, Limited, and others; Newbury Borough Extension, from Owners, &c., of lands and houses in Greenham; South Hants Water, from Inhabitants of district of South Stoneham Rural Sanitary Authority; Tredegar Water and Gas, from (1) Ebbw Vale Local Board, (2) Ebbw Vale Steel, Iron, and Coal Company, Limited.

A petition against the Manchester Corporation Water Bill (the petitioners not praying to be heard) was presented from Members of the University of Cambridge.

TUESDAY, FEB. 12.

The Examiners reported that Standing Order 62 has been complied with in the case of the Bournemouth Gas and Water, and the Southport Water Bills; and that Standing Order 63 has been complied with in the case of the Hemel Hempstead District Gas Bill.

Bills read a second time and committed:—Lewes Gas; Manchester Corporation Water; South Hants Water; West Houghton Local Board.

Petitions were presented against the following Bills:—Bangor Water and Gas, from London and North-Western Railway; Manchester Corporation Water, from Owners or occupiers of land in St. John's, Casterigg, and Wythburn; Newbury Borough Extension, from Speenhamland Improvement Commissioners; Southport Water, from Corporation of Southport; Tredegar Water and Gas, from London and North-Western Railway; Weston-super-Mare Improvement Commissioners, from Great Western Railway Company.

A petition was presented from the Corporation of Southport for dispensing with Standing Order 129 in the case of their petition against the Southport Water Bill.

## MANCHESTER CORPORATION WATER BILL.

## THE THIRLMERE SCHEME.

On the motion for the second reading of this Bill,

Mr. E. S. HOWARD said: Sir, in rising to move the rejection of this Bill, the first thing I must do is to state the reasons why I feel myself justified in taking this rather unusual course. I can assure the House that I should not have undertaken so great a responsibility if I had not believed the assertion of a very high official authority that the circumstances of the case will justify such a proceeding. The first contention of the promoters of the Bill is, that it would be unprecedented to refuse or to reject a Bill of this kind on the second reading, unless its object is of a novel character,

and contrary to public policy or to general law. I do not pretend that the object of the Bill is altogether of a novel character, but I do say that the Bill raises questions which were never raised before, and of such importance, that they cannot be dealt with in the ordinary manner. From time to time there have appeared in the local newspapers in the North, statements that such and such a town—sometimes Newcastle, sometimes Liverpool, and sometimes Manchester—was contemplating a scheme for obtaining a supply of water from one or other of the lakes. Hitherto, all these schemes have come to nothing, and this is the first of the kind that has seriously been brought forward. At first it was thought that there was nothing unreasonable in the proposal. Honourable members are aware that Glasgow is supplied with water from Loch Katrine, and it was naturally thought that, if Manchester was in want of water, and there was no other available source of supply, and Manchester could afford the expense of bringing it from so great a distance, there was nothing unreasonable in going to Thirlmere for the supply. But when Mr. Bateman's plans and estimates were made known, we, who live in the lake district, changed our opinion, for we found that there was hardly any analogy between this scheme and that of Loch Katrine, and that it involves such great changes in the natural character of the lake district, that we could no longer look upon it with indifference. Under these circumstances we thought it not unreasonable to ask the House to postpone the Bill, in order that a full and public inquiry might take place. We think that the natural scenery of the lake district is worth preserving, and we know that there are many schemes of this sort on foot. Liverpool contemplates a scheme of this kind, but proposes to go to Wales to carry it out. Wigan and other towns are in the same condition; and therefore we think it better to have a Select Committee or a Royal Commission to consider the whole question of the water supply of these manufacturing districts, in order to see how far recourse may be had to the lakes, and under what conditions and limitations. We are strengthened in our request by the report of the Duke of Richmond's Royal Commission, which sat on the Metropolis Water Supply Bill in 1869. That Commission was instructed also to inquire into the supply of the provincial towns, but they reported that such an inquiry would be one of great magnitude, and would involve a great amount of geographical and topographical knowledge over the whole country. They, therefore, found it impossible to undertake that further inquiry without further powers, and they resolved to complete their report on the lesser subject—the Metropolitan Water Supply—and to limit their recommendations on the larger question to general principles. They prepared an elaborate map of the geographical distribution of sources of water, and they recommended shortly, first, that no town or district should be allowed to appropriate the source of supply which naturally and geographically belonged to the town or district nearer to that source, unless there were special circumstances which justified that appropriation; secondly, that when a town or district was supplied, by a line or conduit, from a distance, provision should be made for the supply of all places on that line; and, thirdly, that on introducing a Water Supply Bill to Parliament efforts should be made to make the measure applicable to as large a district as possible, and not to limit it to the town immediately needing the supply. Now these are important questions, and it is quite worth while to have a Select Committee or a Royal Commission to inquire into them. But the promoters of this Bill object to any opposition, chiefly on three grounds. First, they say our objections are entirely sentimental, and such as no sensible or practical man would listen to for a moment; then they urge that the wants of Manchester are very pressing; and lastly, that they have no other source of supply. Now, first let me answer their objection that our agitation against the Bill is purely sentimental, and ought not to be listened to. But though they object to our sentimental views, they have condescended to meet us on our own ground. Mr. Grave, the Chairman of the Water-Works Committee of the Manchester Corporation, and the real author of this scheme, and Mr. Bateman and the Water-Works Committee themselves, all consider that the beauty of Lake Thirlmere will be very much enhanced if this scheme is carried out. Mr. Bateman says the size of the lake should correspond with the loftiness of the surrounding mountains, that Thirlmere is very small and the mountains around it very high, and that the carrying out of the Manchester scheme would make the lake much more in harmony with the surrounding scenery. Mr. Grave, in a recent letter to *The Times*, says that "Nature has for years been at work destroying her own primitive and untouched beauty." Lake Thirlmere, in fact, is growing very old and very ugly, and it is high time that it should be restored by the appliances of engineering art, that object being attained by turning Thirlmere into a reservoir to supply Manchester with water. Some of the arguments against us are founded on questions of mathematical accuracy; for instance, if Thirlmere is very beautiful with only 300 acres of water, how much more beautiful must it be when its area is increased to 700 acres. One island at present in the lake will be submerged by the Manchester scheme, but in place of that they propose to produce two new ones, and if one island is beautiful, two, of course, will be twice as pretty. Then they propose to construct a dam which will raise the level of the lake 50 feet. That dam is to be invisible except to persons on the top. It is to be as irregular and picturesque in form as the neighbouring crags and rocks; it is to be ornamented with beautiful shrubs; and last, but not least, in future the place will, no doubt, become the *habitat* of a variety of rare birds. That is the last straw which is to break the back of our sentimental opposition. They propose to buy, if they have not bought already, 10,000 acres of the adjoining common ground, and they are quite prepared to throw that open to the public for ever, and to make two brand new roads all round the lake. The lake and its surroundings are, in fact, to be converted into an extensive people's park, with a Serpentine containing two artificial islands in the middle, and a great broad path all round. But there are some people who, after all, prefer Thirlmere as it is—small, wild, and inaccessible. We have been taunted with being sentimentalists and enthusiasts; but I do not see anything wicked in that. I can appeal to Lancashire sympathy on this question. I regret that the Home Secretary is not now in his place, because I should like to appeal to him. Not long ago he delivered a lecture on what is called "Truth in Art," and in that he said that he entertained great objections to people who wore sham buttons on their boots. If he is such an advocate for truth in art, surely we might have counted on his advocacy in endeavouring in our poor way to preserve the truth of nature. So much, then, for our sentimental opposition. I now come to what Mr. Grave calls "the absolute wants of two millions of people." In the first place, I must point out that that statement is not exactly an accurate one. I am afraid Mr. Grave's mind must have got muddled with his own magnificence, or with the magnificence of Manchester, for, so far from there being two millions of people in that city, there are only 800,000. The statements which I now make are furnished by Mr. Grave and the Water-Works Committee of the Manchester Corporation. The district which Manchester is to supply is 84 square miles in extent, and comprises 800,000 persons. The present source of water supply, Mr. Grave stated, would in the summer afford 25,500,000 gallons per day; but Mr. Bateman has since reduced the amount to 23,000,000 gallons. In 1875, Mr. Bateman reported to the Water-Works Committee that, owing to the large increase in the demand for trading and



other purposes, the supply per head of population was 22 gallons per day. By a very easy calculation, we find that the 24 million gallons per day would supply one million persons with 24 gallons per head per day, which would be a thoroughly ample supply; and if the population of Manchester increases at the same rate in the future as it did during the 10 years before the last census, in 10 years time the population would not have reached a million, but would be something over 900,000. If, as Mr. Bateman says, the present supply will produce 24 million gallons per day, there would be an ample supply for over 900,000 persons at the very liberal allowance of 24 gallons per head per day. That is not my statement of a liberal allowance; it is the statement both of the Water-Works Committee and of Mr. Bateman, and, therefore, we say that Manchester can be in no great want of water for 10 years to come. Mr. Bateman argues from an opposite point of view, and, taking the increased consumption year by year, he says that during the last two years the increase has been as much as 1,200,000 gallons per day, and that you cannot count on a less increase than one million gallons per day for each year to come. Well, the people of Manchester now require 18 million gallons per day, and, by this calculation, they will require in 10 years 28 million gallons per day. But as Mr. Bateman before considered that 22 gallons per head was sufficient, we cannot think that 28 gallons per head is a necessity. Such a supply must be in the nature of a luxury, and, therefore, we cannot say that the Manchester Corporation have proved their case as to the absolute necessity of having this Water Bill passed immediately. But I may be told that I am proving too much; that it is quite impossible that a Corporation like that of Manchester should have come to Parliament with a Bill of this sort if they had not good reasons for doing so. But, in the first place, why is such a Bill asked for? I believe they have already expended much money in buying the property. Mr. Grave lives in the neighbourhood, and he has been carefully nursing the whole district for two or three years, buying here and there. Until the whole scheme came out, they did not anticipate that anybody could say "No" to Manchester, and they believed that Parliament would be no exception to the rule. They thought that, having spent thousands of pounds in the matter they could easily get Parliament to ratify the purchase. The present water-works of Manchester were commenced about 22 years ago, and it was then estimated by Mr. Bateman that the cost would be £450,000, and that they would provide a supply of 34 million gallons per day. But the actual cost has been over £2,000,000, and the supply of water that Manchester has acquired by it has shrunk from 34 million to 24 million gallons per day. The result of this is that the Manchester Corporation find that though they thought they had provided for many generations to come, such is not the case, and the income arising from the city is not sufficient without hardship to bear the cost of the introduction of a supply for the future. The consequence has been that they have come to Parliament with Bills to extend their area of supply, intending to sell the surplus, which in time will be required for future generations, for trading purposes outside the city, and thus increase the revenue of the Water Committee. Let me read the statement of Alderman King, who tried to go into the figures of the case, but who was unable to do so, principally because the Water-Works Committee of his own Corporation refused to give him any information whatever. But still he found out as much as he possibly could. He says the anxiety to sell water is manifested in a variety of ways, and the Water-Works Committee have congratulated the Council on the increased funds obtained by its sale. Mr. King read several extracts from the Committee's reports congratulating the Council on selling the water for trading purposes, and went on to show that they had passed two Acts since the first, by which they had extended the area of supply. The last Act, passed in 1863, showed how great was their wish to do that. I need not quote any further to show the anxiety of the Corporation to sell their water, to extend the trade around the city, and thus to increase their own revenues. The result is that they think they will be short of water much sooner than they expected years ago. We are told that the welfare of the poor people in and around Manchester depends on the prosperity of that city, and that its prosperity depends on the extension of trade. But I do not think the extension of trade is so much to be depended upon. What have we seen lately? There was a time, not long ago, when the expansion of our trade was considerable; new mines were opened, new mills, and new factories set at work, and thousands of people were brought into all these districts to share in the prosperity which was to result from the extension of trade. But now what has happened? Bad times have come, trade has become dull and depressed, and these extensions of industry cannot be carried on any longer with profit. The mines are closed, the mills and factories are shut up, and thousands of people have been thrown out of work, with nothing to do but to become paupers, and subsist on the charity of the public. I do not profess to understand these questions of political economy, but if all this is the necessary consequence of the extension of trade, I do not think the result is satisfactory to many people. It is a grave and serious question, whether we are justified in encouraging a forced extension of trade. I have shown that the object of the Corporation of Manchester in their proposal is to extend the trade in order to benefit their revenues. Within Manchester they do not require the water for domestic or sanitary wants, and in point of fact it will be found that this is a gigantic speculation to carry out works at an estimated cost of £4,000,000, which will probably be increased to £6,000,000 before the works are executed, without adding one farthing to their own rates. These are very important questions, and they ought not to be settled as they will be settled if this Bill is allowed to proceed in the ordinary way. We know that other large towns, such as Liverpool and Wigan, will be wanting water at some time or other, and will probably want to come to the lakes. Why, then, should not a Royal Commission or Select Committee first hold this inquiry which we ask for? Such a tribunal would lay down certain regulations, and every Bill brought in would have to be subject to these regulations, and there would not be the necessity which now exists of fighting such a Bill as the present at enormous expense. I must say that throughout the whole country we have found the greatest public interest alive on this question. We have had petitions from every county in the country, and from several thousand persons representing every rank and position, all interested, and all wishing to preserve that interest, if possible, as far as they can reasonably do so. On the other hand, the friends of the Bill have presented petitions which they say are from the people of the country. I do not wish to weary the House by reading letters on the subject; but the whole of these petitions have been got up in the most scandalous manner, and many of them have been signed by fraud. When it is represented that the Local Boards of Penrith, of Grasmere, and of Keswick have petitioned in favour of the Bill, it should be stated that the petition was carried in the Penrith Board by six votes to five, and in the Grasmere Board by four to three; and of the four who were in its favour, three were publicans and one was a painter. I have endeavoured to show, as well as I can, that our sentimental opposition to this Bill is not so unreasonable as some seem to think, that we do not wish to press it to an unreasonable extent, that the Bill is not intended to supply Manchester's domestic and sanitary wants, but is much more in the nature of a trading speculation. I have endeavoured to show that there are very grave questions raised by the

Bill which ought to be matter for national inquiry, and ought not to be left to be fought out by a few poor Landowners on one side and a powerful Corporation on the other. The sequel to the Duke of Richmond's Commission has never taken place, for there has never been an inquiry, as the Commissioners suggested, into the water supply for manufacturing districts. In order that such an inquiry may take place, I beg to move — "That the Bill be read a second time on this day six months."

Mr. LOWTHER: In seconding the amendment for the rejection of this Bill, I may say that my honourable friend, the member for West Cumberland, has put the case so ably before the House that there is little for me to add to it, and in what I have to say I will be as brief as I can. Cumberland is one of the most beautiful counties in England, but if this plan be carried out, a very beautiful part of the county will be very much disfigured. The lake, we are told, will be raised 35 feet, and that alone will cause the submergence of a large portion of the land. The Corporation of Manchester wish to take 11,000 acres of land in the neighbourhood for this purpose, and 6000 acres more between Thirlmere and Manchester, thereby occupying a very large space. The area of the lake will be increased from 335 acres to 800 acres. My honourable friend opposite has already dwelt upon the pretence that the Manchester Corporation are going to beautify that part of the country. If they would only leave it alone, we believe it would be quite as well. Manchester has herself admitted the beauty of that part of the country, and has also admitted that that beauty would be very much interfered with, and very much destroyed, by this plan. The Corporation of Manchester are, no doubt, very powerful and very rich, and this is very much a question of who has the longer purse. The Manchester Corporation despise those who are opposed to this scheme, but if I know anything of the place, I think the House of Commons will be rather inclined to take the part of the weaker side, and will not allow this scheme to be carried into effect. We shall be told, no doubt, that water is taken from Loch Katrine to supply Glasgow. Well, that is so, but it is done without disfiguring the loch, and probably the gentlemen who live around Loch Katrine may have thought it convenient to let the water be sold to Glasgow. We have another instance of a lake being taken for a town supply in the case of Ennerdale, in Cumberland, water from which is taken by the town of Whitehaven, and the lake is said to supply the ships at Whitehaven with excellent water; but if any one who is fond of the picturesque will go to Ennerdale, he will find that there is no dam there, and nothing at all which is disfiguring. According to the provisions of the Lands Clauses Consolidation Act, I believe that, in carrying out a scheme of this kind, any surplus land which is taken must be offered for sale to the neighbouring proprietors; but in this Bill the Manchester Corporation put that provision entirely on one side, and say they are not thus to apply to the surplus land they may acquire. Another provision is that if what is called the curtilage is touched, those who touch it are bound to take the whole of the property. But an exception from this in their favour is made by the Corporation of Manchester in this instance. Then there is another exception to be made in favour of Manchester in regard to mines, for any regulations with regard to mines are in this case to be entirely put on one side. The amount of space which will be required for conducting the water is, I suppose, equal to that which would be required for a railway; and the water is to be carried by five lines of pipes, and those lines are not to be put down all at once, but one line is to be put down every five years, so that the whole country will be in a continual state of disorder, and will be constantly being pulled to pieces. The people of Manchester and the neighbourhood are now 800,000 in number, and they propose, it is said, to take water enough for three millions of people. But where are those three millions? Our belief is that such a scheme will not be wanted for 20 years. Then, again, the Corporation of Manchester do not pretend to state that this water is wanted for domestic purposes. No doubt it is wanted. The Corporation of Manchester are in a very good way of doing a first class business, and I should not be at all surprised if in the course of time we found the water carried to Manchester, and supplied to some other places on the road, with the result that Manchester will get her water for nothing. Manchester was not always the great town it is now. In 1753 Manchester had only 1700 inhabitants. Honourable members have no doubt received a document from the Manchester Corporation, in which they say that it is wholly unprecedented to reject a private Bill unless it is one of a novel character. Now this Bill is of a very novel character. Then they say that it is promoted by a large population; but that is no reason why injustice should be done, and why the weaker side should go to the wall. And then they say that a large sum of money has been expended, and therefore that the Bill ought to pass. Now that is a very bold statement, and I should not have thought they had the amount of boldness to say that because they had spent a large sum of money the Bill ought to pass. They say that the engineering work proposed is of the most trifling description. On the plans which have been deposited, however, we see embankments 10 and even 17 feet high. Then there is an aqueduct. The water must be carried over the valley somehow, that is clear, and honourable gentlemen will understand whether that can be done without interfering with the scenery. I am quite willing, however, to leave the matter to the Committee, confident as I am that, though Manchester is powerful and rich, there are many members who will recognize the necessity of looking after the interests of less powerful and poorer districts.

Mr. BRILEY: It is very much to be regretted that the Bill is opposed on its second reading by the honourable members for Cumberland and Westmoreland. No argument has been brought forward which would justify the House in rejecting a Bill of this character at this stage. It has not been proved that the Bill will injuriously affect the health and the social enjoyment of those who are opposed to it. On the contrary; we have the very highest authority that it is very much the reverse. I rely upon this, that if it be necessary for the health and comfort of the people of Manchester and neighbourhood, the arguments used by our opponents fall to the ground. I insist that this is the case. Now, the member for East Cumberland has attempted to show that we have plenty of water for many years to come. He, perhaps, calls five or six years many years, but it is absolutely necessary that we should look further ahead. The honourable member's calculations are incorrect, for we cannot claim any longer time than the period I have mentioned. I should have thought that the case of Loch Katrine would support *prima facie* a precedent for the Bill going to a second reading. The people of Glasgow have benefited much by that scheme, and I expect that the people here will do the same thing. He says that it is a comparatively small sum, for which they expect to get a very large supply of water, and they have been disappointed, and have spent a very large sum to get a small supply. Then it is said that we want water for trading purposes. That is quite true, and the Manchester Corporation are under a statutory obligation to supply it. I hardly think it necessary to go further into this matter; but we have heard a good deal about the picturesque beauty of the Lake district. We are not going to have great ugly embankments, or anything of that kind. Most of the conduit-pipes will be underground, and, though we have to cross the river, care will be taken to see that the aqueduct will not be an eyesore. So far as I am concerned, I wish to see the picturesque scenery retained; at the same time, however, utility must prevail. In the fifteenth and sixteenth centuries, poets seemed to regard the Lake district as a very



charming country to live out of, while so late as a century ago Gray, writing on the same subject, passed by Windermere with very slender praise, and when he came to Grasmere he remarked that there were no houses or gardens in the little paradise. There is a remarkable difference among the arbiters of taste on the subject, and it is no more than possible that in the course of 100 years the neighbourhoods of Windermere and Grasmere will be as closely populated as the neighbourhood of Manchester. I hope the second reading of this Bill will be agreed to.

Mr. RODWELL: I should wish to say just a few words on this question, which appears to be one of a very important character, and has caused a very considerable degree of excitement outside, as well as inside, the walls of this House; and not the less so because I understand—in fact, know—that the Corporation of Manchester have taken steps to call the attention of boroughs to this question, and have asked them to use any influence they could with reference to the principle of the Bill. The consideration of this question has, consequently, assumed far larger proportions than is customary with ordinary private Bills. I do not propose for one moment, especially after the able and lucid speech of the honourable Member for East Cumberland, to enter into any of the details. I would only ask the House whether it is prepared to approve of a Bill founded on two decidedly novel principles. And here I hope I may be excused for suggesting that, if the Bill passes the present stage as it is, the Select Committee will probably consider themselves precluded from considering those two novel principles. The population of Manchester is 800,000, and it is proposed by this Bill to take powers for supplying water to three millions of people. The promoters propose to raise three or four millions of money for the purpose of the carrying out of the undertaking, and for recouping themselves for engaging in so gigantic a speculation. Now, legislation has never, hitherto, given any such powers to a Corporation. No public body has ever been clothed with statutory powers for the purpose of making profit out of the commodity of water, and, therefore, I say this is a novel principle in the Bill now before us. The second novel principle is in connection with the question of taking water from distant watersheds. This question was discussed in the report of the Royal Commission on Water Supply, which sat a few years ago under the presidency of the Duke of Richmond. The proposal here is for Manchester to take water from a district more than a hundred miles off. It is a very similar scheme to one which was submitted for Liverpool some time ago, and in regard to which Mr. Bateman, the Engineer of the present scheme, suggested to the Commissioners that the wants of the immediate district should be respected. The Commissioners, in their report, said the Legislature had always jealously watched any proposal for a town to take water from a distant gathering-ground, lest by doing so other places nearer hand might be deprived of their natural supplies. Mr. Bateman put this point very strongly in the case of Liverpool, and I now refer to the subject in order to impress on the House that the question is one of national importance which ought not to be relegated to the decision of a private Committee. The Commissioners, to whom I have referred, said further, in regard to the Liverpool case, that if it were necessary for water to be brought from a distant gathering-ground, care should be taken to supply all the places along the route. Now, why is there no provision of this kind in the Bill before us? Why is a Bill introduced in direct opposition to the spirit of that report? It is important that such questions should be considered here, for they cannot be fairly discussed in Committee. The causes of this are obvious. In the first place, there is the difficulty of *locus standi*, the consequence of which is that a great number of the outside public, though deeply interested in the question at issue, can never be heard at all. I have been in communication myself with friends living in different parts of the country, some of whom are in the habit, at certain seasons of the year, of residing in the Lake district, and who have no means other than this I am now adopting of making known their views. A Select Committee, I must repeat, are not, in my opinion, the proper tribunal for the consideration of a question such as this; it should go before a tribunal with a large scope, which could decide on all the merits of the question without being hampered by technical rules. The New Forest Bill was one of a strictly analogous nature, and it was dealt with in a way that was to a certain extent satisfactory. The question, as I have said, is a national one, and I venture to think that some Commission or Committee might take the matter in hand, and report, not only upon the details of the scheme, but on the principle involved in the Bill. If further precedents were required for adopting this course, I might refer to the Ancient Monuments Bill, in regard to which there was such an inquiry a few years ago. There are other matters in regard to which I could have wished to say a few words; but I do not want to detain the House, and, therefore, I will conclude by saying that I think it would be much more satisfactory to all interested in the scheme to have its merits considered by a public Commission.

Mr. JACOB BRIGGS: The honourable member opposite seems to think that Manchester is guilty of a great injustice to the neighbouring towns by promoting this scheme. It is a little curious that none of the neighbouring towns have petitioned against it. The real fact is, that the minor towns are benefited by Manchester going to Thirlmere. Manchester leaves many other gathering-grounds free, being able to afford to promote a large scheme like this. We should not go there for water if we did not want it, and we should not propose this scheme unless we thought it the best scheme available. The opponents have spoken of the Bill as if we did not want the water. If you wish to show that we have plenty of water, let this Bill pass its second reading. We cannot show on the second reading that we have not plenty of water; but we are sure we can show to the Committee that we have no other available source of supply suitable to our wants, and cannot get water anywhere else at such a cost. It has been said that this is a very great scheme, and that the quantity of water is excessive. We have now 25 million gallons per day, and it is true this scheme would give us 50 million gallons extra. Well, we shall want that extra quantity. The consumption of water in Manchester is a small consumption, and is only about one-half of the consumption of Glasgow; and it arises from the fact that the Manchester Corporation make stringent rules in order to limit the consumption of water. We wish the consumption of water to be abundant and lavishly used, and this we think would be for the benefit of the health and comfort of the population. The honourable members who support the rejection of the Bill have spoken of this as a novel Bill and a novel scheme. Why, it is an exact parallel to the Glasgow and Loch Katrine scheme. Glasgow goes to Loch Katrine for water, and it takes the water to Glasgow exactly as we propose to take this water to Manchester. The Loch Katrine scheme raised the levels of all of the lochs in Scotland. One of them that was interfered with was raised 25 feet. Let me tell honourable members that within the district to which the Corporation are to supply the water there is an annual increase of 5000 houses; but 5000 houses is a very great increase of houses in a year, and with the increase of houses there is an increase of industries, and of industries requiring water. The Corporation of Manchester have to make very stringent provisions at present to limit the supply; but we think that it is as necessary to supply the people with water, as it is necessary to supply their homes with food. In the Lake district there are many large lakes, but there are only three of these lakes sufficiently elevated to enable water to be supplied to Manchester by the

force of gravitation. One of these lakes we propose to use. It is a small lake; it is one of those lakes least visited and least known. It is a lake, the greater portion of which is seen only by pedestrians; it never is seen by people in carriages—at least, a considerable portion of it is so. The hotel-keepers in the district say that they never knew of an instance in which any one took a carriage out for Thirlmere. Something has been said about the petitions against the Bill. Why, in the district of Lake Thirlmere, or in the Lake district, we have ten signatures in favour of the Bill to one that is presented for the other side. Then with regard to the opinion of Manchester, the honourable member says that there is a growing feeling in Manchester against this scheme. There are 64 members of the City Council, and out of the 64 members only four have voted against this scheme. In Manchester and the district we do not possess all the advantages of life. We have a bad climate; we live necessarily in a smoky sky. There are countries where an abundance of water is not wanted, but it is wanted for us. I hope that the House will hesitate long before obstructing this Bill in Committee. We are prepared with abundance of evidence. It is said that we have nothing to say, but almost every objection raised here is an objection that can only be made in Committee.

Mr. RAIKES: We all agree that this is a very important subject, and for my own part I must say that the honourable gentleman who spoke last has made a very valuable contribution to the debate. The honourable Members for Cumberland and Westmoreland have put forward various objections to this scheme. One was the question of scenery, another that of the private rights that would be invaded, and the third as to the desirableness of allowing towns like Manchester to go to distant watersheds for their water supply. The objection which was founded on the interference with the picturesqueness of the district was not much insisted on, and the question of private rights, it will be seen, is peculiarly one that should be settled in Committee. Another question is as to whether the Corporation of Manchester should be allowed to become the proprietors of land in Westmoreland and Cumberland, and along the route of the water-mains from there to Manchester. When I said that the scenery of the Lake district is a secondary difficulty, I meant to point out that the question of necessity was the one above all which ought to occupy the attention of the House. If the promoters of the Bill have made out their case to the satisfaction of the House, and an absolute necessity exists for this measure, then I think I need not trouble myself further; but if they have failed to do so, then I think the case is one rather for the consideration of the House than to be sent to a Committee upstairs. What is the case as put by the honourable Members for Manchester, who have both very fairly, and I think very moderately, stated the case for the promoters? They have told us that at the present moment the water supply of Manchester amounts to about 25 million gallons per day. That supply at the present time is provided for a population of about 800,000, and the supply to each person is about 22 gallons per head per diem. It is perfectly clear, therefore, that the present water supply of Manchester is adequate to the supply of a population of 1,100,000. We are told that Manchester is growing so rapidly that, in the course of a very few years, the population will amount to 800,000 or one million, and that then the necessity for this large additional supply will arise. Now, I know something of Lancashire myself, but I certainly was not aware that the progress of Manchester, although very considerable, was relatively as great as that of many other populations in the north. I believe there are some other parts of that great county and of the northern district in which the progress has been much more rapid, and the claims of the population would, under similar circumstances, require quite as great consideration. What is it that the Corporation of Manchester propose to do? They propose to ask Parliament to give them a water supply of 50 million gallons daily for their population. That is in addition to the existing supply of 25 million gallons per day, which is clearly in excess of the wants of the community; and yet the Corporation of Manchester come and ask that they shall be supplied with such an additional quantity of water as will treble the existing supply, and be equal to the demands of a population of 3½ millions. We have heard talk of heroic legislation. There are Members of this House who consider that it becomes the great municipalities of this country to adopt a more enterprising attitude than they have hitherto done, and they regard this as a legitimate step on the part of Manchester, although it marks a new departure from the course pursued generally by the municipal bodies of the country at large. If Manchester is to be allowed to have this enormous supply of water, if Manchester is to take sufficient to supply at this moment the whole of the county of Lancaster, you will have to consider three different bodies that will be affected by this heroic and enterprising legislation. First, the ratepayers of Manchester. Are they to be burdened with an immense expenditure, equivalent, they say, to a sum of three or four millions of money, but which would possibly reach seven or eight millions before the scheme could be carried out completely? Secondly, the owners of property throughout the district, who, for a distance of considerably more than a hundred miles, would have to submit to an interference with their property by the formation of a gigantic culvert equal in extent to a dozen lines of railway. Lancaster, Preston, Accrington, Wigan, Bolton, and many other towns will have to come to Manchester and ask for water; and, although you may be told that Manchester does not propose to monopolize the supply, yet the fact will be that for years to come you will have all these great populations throughout Lancashire and the North of England, and probably in the West of Yorkshire also, coming and asking for Bills to legalize arrangements made with Manchester with respect to the water supply. I am sorry that I have detained the House at such a length, but this seems to me one of the most important questions the House can consider. If the question stood as it was left by the speech of the honourable member who first addressed the House, I should feel it my duty, although exceedingly reluctant to take such a course, to vote against the second reading of the Bill. But a suggestion has been thrown out by my honourable friend behind me, the member for Cambridgeshire (Mr. Rodwell), which I hope the House will adopt, and I trust to hear from the Government, before the debate closes, some indication of their views. It is impossible that such a Bill as this could be considered upstairs, and by an ordinary Private Bill Committee, and I would suggest that it should be referred to a Hybrid Committee, which is one of the most useful parts of the arrangements of this House. The Committee then might consider this question through all its bearings, public as well as private; and they might, at all events, lay down a principle for the guidance of the House in dealing with future questions connected with the water supply of large towns. Until such a Committee have sat upon the Bill, I do not think we should be justified in refusing to read the Bill a second time; but, unless such an arrangement is come to, I should most reluctantly, but as a matter of duty, find it impossible to support the second reading of the Bill.

Mr. W. E. FORSTER: I quite agree with the course which has been recommended by the honourable gentleman who has just spoken; and, if the House will allow me, I will support it on one ground, which he scarcely referred to. I do think that the public are concerned in the question. I am very sorry to throw any obstacle in the way of my honourable friend the Member for Manchester. I do not think we ought to throw any obstacle



in the way of our large cities obtaining an adequate supply of water. It is possible that Manchester may be now asking for more water than most other towns, and, perhaps, for more water than appears to be necessary; but if so, I think it is a fault on the right side, and I should be sorry to throw any obstacle in its way. But, on the other hand, in the manner in which they propose to get their water, I do think they are likely to interfere with the public interests. Now, I hope I shall not be thought to be Quixotic or over-sentimental when I say that the scenery of the lakes is a public interest. My honourable friend the Member for Manchester quoted the lines of a poet a hundred years ago, in which the writer did not appear at that time to regard the lake scenery with the eye of an artist. He appears to have been horrified and disgusted by the mountain scenery rather than pleased with it. But that is not the feeling now, and I do not look forward to any period when it will be. We have, then, this fact, that we have in this part of England some of the most beautiful scenery in the world, and I think the House of Commons and the country should retain it. Some of the supporters of this Bill think that the scheme would not injure the lake which will be principally affected by it. I wish honourable members would go down to the district and look at the lake, and see for themselves what is going to be done. We are told, in the first place, that Thirlmere is a lake which very few people go to see, and that most tourists who visit the lakes pass by it without seeing it. Now all you have to do, if you wish to see Thirlmere, is to go from Ambleside to Keswick, and go round the lake. A very little time will enable you to see its beauties, and to discover that it is one of the most beautiful objects in England. The Corporation of Manchester say they are not going to spoil it. Yet they are going to put at the upper part of this beautiful lake a great big reservoir, which may go up and down some 50 feet at least on account of the rainfall in the district. A heavy rainfall is very often followed by a season of drought, and I believe the engineers are perfectly right in arranging for such a fluctuation of the level of the reservoir. The consequence will be that, instead of a very beautiful lake, you will have a great pond, with a constant exposure of mud. (No, no.) At any rate, if the honourable member who says "No" will visit some of the other lakes in the neighbourhood, I believe he will come to the conclusion that there may be a good deal of mud, and the beauty of this very beautiful scenery will be spoiled. Loch Katrine has been mentioned, but Loch Katrine is not a parallel case. Loch Katrine is so large that in supplying Glasgow with water there is no perceptible alteration in the level. It would be very different in the case of Thirlmere. Now I quite admit that if Manchester cannot get water except by going to Thirlmere, even if the consequence would be that the lake would be utterly spoiled, then the lake must be spoiled. Manchester must have enough water for its own drinking and sanitary purposes. There cannot be a doubt that in arranging this matter there ought not to be a question between scenery and a proper supply of water to any large population; but if, instead of this being the only place from which Manchester can get a supply, it turns out that Manchester could get it from many other places, I think that fact would make a great deal of difference in the view we should feel inclined to take of the question. It is said that there is a gentleman of great energy—I have not the honour of his personal acquaintance—who has set his mind on going to Thirlmere—that it is his great wish to carry out his plan in regard to Thirlmere; but that is not a sufficient reason why the beauty of the lakes should be sacrificed, nor is it a sufficient reason why the Corporation should spend four millions, which will probably grow to six millions, upon this particular scheme. The present estimate is, I believe, £3,700,000; but there is very little doubt that the actual expenditure would be considerably more. That, however, is a question for the ratepayers of Manchester, and not for me. Taking the lowest estimate—viz., £3,700,000, if it was only a case of spending one or two hundred thousand pounds more, I do not think Manchester ought to be opposed; but why not let all these questions go to a Committee? Let them be examined by a properly constituted Committee upstairs, like any other question, and everything would then be arranged and settled by those who are interested in the matter. But you cannot expect the general public of England, who are deeply interested in this scheme, to pay large engineering bills or counsel's fees, or to appear before a Committee to state their case merely through some riparian owner. Therefore I support the suggestion of my honourable friend that the question should be sent to a Special Committee *ad hoc*, because I believe the public ought to be represented, as it is a public question. I hardly think that the promoters themselves will object to such a course. Surely they will acknowledge that the English people have some interest in such scenery as this, and will admit that it is quite fair that they should be thoroughly heard before a Committee. I can only say that my vote will depend on whether such an arrangement can be made. I should prefer that there should be a general inquiry by a Committee, or a Commission, into the water supply of the large manufacturing towns, and I think London ought to be included. The inquiry should extend to how far there ought to be a supply obtained from those districts where there is a great rainfall, and under what conditions it should be given. It may be rather hard on Manchester to oblige them to wait until there has been such an inquiry, but I must say that one argument they would give us is not an argument at all. If the Corporation of Manchester have chosen in some measure to forestall the decision of Parliament by buying property at a considerable cost, they must take the consequences. Our object now is to secure a thorough inquiry, and if a hybrid Committee are appointed for that purpose, then, I think, we ought not to vote against the second reading of the Bill. Otherwise I shall be obliged personally to vote for the amendment.

Mr. BIRLEY: If it be the wish of the House, I am prepared to accept the proposition of the Chairman of Ways and Means.

Mr. CHARLEY: An honourable member who spoke in opposition to the Bill seemed to think that there had been some difference of opinion among those who would have most benefited by it. I can say that that is not so, and that, so far as the Corporation of Manchester are concerned, they have passed an unanimous vote in favour of the Bill. My honourable friend, the Member for Chester, said there had not been a large increase in the neighbouring population. Speaking for Salford, all I can say is that in 1871 the population was 120,000, and that it is now 200,000. Therefore, as far as Salford is concerned, that observation does not apply. In my humble judgment, the interests involved in a sentimental grievance ought not for a single moment to be allowed to weigh against the interests represented by the honourable Member for Manchester.

Mr. FLETCHER: As a resident in the county of Cumberland and in the neighbourhood of the great works proposed to be carried out by the Manchester Corporation, and representing the opinion of a great many of the residents of the Lake district, I trust the House will pardon me if I detain them for two or three minutes. I will not enter at all into the engineering matters which are connected with this scheme, but I will allude merely to its æsthetic aspect, which must be interesting to every member of the House. It seems to me that there is a good deal of misapprehension as to what is proposed to be done by the Manchester Corporation. The right honourable Member for Bradford has alluded to the question of the rise and fall of the lake. He seems to be altogether under an error as to what is proposed to be done. I can assure the House that

even if the Corporation draw the full 5 million gallons per day which they propose to take, the lake will not rise or fall more than it does at the present moment. The effect of this Bill will be to reclaim 11,000 or 12,000 acres of the most beautiful part of Cumberland from the incursions of those æsthetic gentlemen who come down surveying the district and building Gothic villas upon the shores of this beautiful lake. The Corporation of Manchester have no intention of selling any portion of the area for building purposes, and, in fact, so far from Thirlmere being spoiled, I look upon it as a great public improvement, and as a brand plucked from the burning. You will find that every advantageous point has been seized by these æsthetic gentlemen for building their villas and for discharging their sewage into the lake. There is nothing whatever proposed to be done by this Bill which would be prejudicial in the slightest respect to the county of Cumberland. If there is one town which is more interested than another in the preservation of the beauty of the lake, it is the town of Keswick, and what do I find? In a town of 700 ratepayers, 650 are in favour of the Bill of the Manchester Corporation. They believe that so far from the Lake of Thirlmere being spoiled by what is proposed to be done, it will practically be improved. This is a great scheme, and a scheme which ought not to be buried in its inception; and I hope the House will by a large majority pass the second reading of the Bill.

Mr. SCLATER-BOTH: I have listened to the arguments which have been adduced both for and against the second reading of the Bill. The provisions of the measure were brought before me some weeks ago by a deputation from Manchester, and I had the advantage of hearing from the accomplished Engineer of that Borough his views as to the mode in which it was proposed to carry out this scheme. I think the House will admit on all sides that there is much that is novel in the plan, something *prima facie* objectionable, and a great deal that ought not to be considered and decided by an ordinary Private Bill Committee. Now, I have always felt that there is a great difficulty in getting upon a Private Bill Committee a fair and adequate representation of the interests involved in such a measure as this. But it appears to me that it would be a harsh and unusual proceeding to refuse the second reading of a Bill involving a matter of so much importance to so great a community as Manchester. On the other hand, it is equally necessary that the Bill should go before a Committee where the allegations so admirably stated by my honourable friend the Chairman of Ways and Means may have a reasonable opportunity of being examined. The reference I had proposed on the subject would be something to this effect: That the Bill be referred to a Select Committee of nine members, five to be nominated by the House and four by the Committee of Selection, and that such of the petitioners as may have presented petitions for or against the Bill may, if they think fit, be heard before such Committee by their counsel or agents; that it be an instruction to the Committee to inquire into and report upon the water supply of Manchester and the neighbourhood, and how far and under what conditions permission shall be given to make use of any of the Cumberland or Westmoreland lakes for such supply, having particular regard to the requirements of the population in the immediate vicinity of the lakes; and to report whether any, or, if so, what, provisions will be required to be made. This proposition, I believe, includes all the objections which have been raised in the course of the debate, and if the House should be of opinion that the Bill should be read a second time, I will move a resolution in accordance with the suggestion I have made.

Mr. PERCY WYNDHAM said: I will not enter into the merits of the case, as we now understand that the scope of the inquiry is to be very much enlarged. But I wish to put a question to my right honourable friend the President of the Local Government Board. If we are to understand that an inquiry of this nature will be entered into, it must necessarily cost an immense amount of money. Who is to pay the expense of opposing the Bill? The opponents will be virtually fighting the battle of the United Kingdom, and I would suggest that, instead of referring the Bill to a Select Committee, there should be a Royal Commission.

Mr. DONSON said: The Hybrid Committee, before whom the Bill is to be sent, will hear all the opponents of the Bill, and further hear all witnesses, just as if it were a Public Committee appointed to inquire into a public matter. If the proposal of my honourable friend the Chairman of Ways and Means, and endorsed by my honourable friend on behalf of the Government, is carried, it appears to me a very proper course to adopt, and I would recommend the members interested in the Bill to agree to the proposal.

Mr. E. S. HOWARD said he would be very willing to accept that elucidation of the difficulty. He did not think they should ask any more, and he should therefore withdraw the amendment.

Mr. FAWCETT: I wish to ask a question before the Bill is read a second time. It has been admitted that this is a public question, and one in which the whole country is interested. The President of the Local Government Board has read out something which he proposes, but what he read was very imperfectly heard and without having seen it on the paper we are asked to assent to it. What I wish to ask is, that we should have at least 24 hours to consider the terms of this reference before we actually decide upon adopting the proposal. I may be under a mistake, but it seems to me, as far as I gathered the words, the terms of the reference he proposes will admit what seems to me to be the gist of the whole inquiry—that is, whether, if this additional water be necessary for Manchester, it cannot be obtained except from the lakes. I think the great majority of this House and of the country think that if she can get it from any other place it is not desirable she should go to the lakes, because the lakes are particularly beautiful pieces of scenery which ought to be preserved. Therefore it seems to me that the terms of reference are not sufficient, but that there should be an instruction to the Committee that they should not only make inquiry about the lakes, but also inquiry as to whether the necessary water could not be obtained from any other place.

Mr. NEWEGATE: I desire to make only one observation. I think the House is giving the Corporation enormous powers, I believe almost rash powers, for a work which is in the nature of a speculation supported by public money. We have before the House a Bill for creating some uniformity, some consolidation, in the governments of counties and towns. At present the districts affected by this scheme have not by the admission of the House that concentration of powers which is desirable, and I rejoice that the Government has brought in a measure which may adjust the differences and the powers that now exist as between the large borough interested and districts which will be affected by this scheme.

Mr. WHITWORTH: I beg to endorse the suggestion of the honourable Member for Hackney, that the President of the Local Government Board should give us 24 hours, because I believe there is no doubt that within the district from which the Manchester Corporation are proposing to obtain water there is sufficient water to provide the whole kingdom, if properly utilized. This is an important question, and I hope the reference will be put on the paper before it is finally debated.

Mr. SCLATER-BOTH: It is necessary that I should put the first part of the reference now, otherwise the Bill would go to an ordinary Committee. But as it seems to be the desire of the House, I will put the words of the instruction, which I propose to move, on the paper, and then the House will adopt it or not, as it thinks fit.

Mr. JULIAN GOLDENID: It would be a much more regular course to post-



pone the second reading of the Bill until we know the exact terms of reference. As I entirely concur in the observations made by my honourable friend the Member for Hackney, I propose to move the adjournment of this debate, and to fix it for Thursday, in order to enable us to see the whole of the terms of reference. This is a matter of public importance, and ought not to be hurried over, and the city of Manchester will gain nothing by precipitation. I think we shall be consulting the interests of Manchester and the country affected, if we adjourn the whole matter till Thursday. I beg to move the adjournment.

Mr. BIGGAR seconded the motion.

The CHANCELLOR of the EXCHEQUER: It seems to me hardly convenient to adjourn the debate. The members who have considered the subject have already taken part in the discussion, and I do not know whether they wish to speak again. I believe it would be far more convenient that the course suggested by my right honourable friend the President of the Local Government Board should be followed—that the House should decide the Bill is to be sent to a Hybrid Committee. It would be quite right, as suggested by the honourable Member for Hackney and others, that opportunity should be afforded to honourable members of seeing the precise terms of the reference; and what the right honourable gentleman proposes to do is nothing more than a simple motion that the question be referred to a Committee, and then he will propose to put on the paper the instructions which are to be given to the Committee. These instructions will come under the notice of the House, and can be discussed and settled at the convenience of the House.

Mr. JULIAN GOLDSMID: We shall be satisfied with this assurance, and I withdraw my motion.

The motion for the adjournment of the debate was then withdrawn, and the Bill was read a second time without a division, and referred to a Select Committee of nine members, five to be nominated by the House, and four by the Committee of Selection, where such petitioners as shall have petitioned for or against the Bill may appear, and be heard by their counsel or agents.

WEDNESDAY, FEB. 13.

WEIGHTS AND MEASURES BILL.—This Bill, to consolidate the law relating to Weights and Measures, was brought in by Mr. Edward Stanhope, Sir Charles Adderley, and the Attorney-General; read the first time, and ordered for second reading.

Petitions against the Cheltenham Corporation Water Bill were presented from (1) Cheltenham Water-Works Company, (2) Mary Lawrence.

THURSDAY, FEB. 14.

Petitions were presented against the Cheltenham Corporation Water Bill, from (1) Cheltenham Gaslight and Coke Company, (2) Thomas Packer Walter Butt, (3) Charlton Kings Local Board, (4) Richard Rogers Coxwell Rogers, (5) Midland Railway Company; and against the Scarborough Corporation Water Bill, from Sir Harcourt Johnstone, Bart.

FRIDAY, FEB. 15.

The following resolution, reported from the Standing Orders Committee, was agreed to:—"That, in the case of the Limerick Corporation Gas Bill, Standing Order No. 62 ought to be dispensed with. That the parties be permitted to proceed with their Bill."

Petitions against the following Bills were presented:—Cheltenham Corporation Water, from (1) Banbury and Cheltenham Direct Railway Company, (2) Anne Catherine Gardiner Welch, (3) Nathan Nathaniel Dyer, (4) Rev. Thomas Purnell, (5) Owners, &c., of houses and lands in Charlton Kings; Nottingham Improvement, Gas, and Water, from Nottingham Water-Works Company; Scarborough Corporation Water, from North-Eastern Railway Company.

MANCHESTER CORPORATION WATER BILL.

Mr. SCLATER-BOOTH moved, in accordance with an understanding come to on Tuesday:—"That it be an instruction to the Select Committee on the Manchester Corporation Water Bill that they have power to inquire into and report upon the present sufficiency of the water supply of Manchester and its neighbourhood, and of any other sources available for such supply; to consider whether permission should be given to make use of any of the Westmoreland and Cumberland lakes for the purpose, and if so, how far and under what conditions; to consider the prospective requirements of the populations situated between the Lake district and Manchester; to inquire and report whether any, and if so what, provisions should be made in limitation of proposals for the exclusive use of the water of any of the said lakes."

Mr. WHITWELL proposed to widen the terms of the instruction by substituting for the words "between the Lake district and Manchester" the words "between the Lake district and Lancashire and Yorkshire."

Mr. SHAW-LEFEVRE pointed out that the original terms of the instruction would exclude Liverpool.

Mr. JACOB BRIGHT and Mr. HARDCASTLE opposed the amendment.

Mr. RAIKES observed that the instruction, as it stood, was based on the recommendation of the Duke of Richmond's Commission, and he thought it would be rather hard on Manchester if its Bill were made the means of raising a very large question in many respects unconnected with that city. The Lake district might supply Yorkshire with water, but the Yorkshire people would hardly care to go there for that purpose. He had no objection to the amendment *per se*, which might deserve the attention of Parliament; but it would tend unnecessarily to prolong the inquiry, and would not be the best or the fairest mode of attaining the object which the honourable Member for Kendal had in view.

Mr. SCLATER-BOOTH having also expressed a hope that the amendment would not be pressed,

Mr. WHITWELL consented to withdraw it.

Serjeant SPINKS then proposed another verbal alteration in the instruction, in order that the town he represented (Oldham), and other places within eight or ten miles of Manchester, might be included within the scope of the inquiry; but, on Mr. Raikes intimating that, in his opinion, the case of those towns would not be excluded by the instruction as it stood, the amendment was not pressed.

The instruction, as originally moved, was then agreed to.

Mr. SCLATER-BOOTH subsequently gave notice that on Monday, Feb. 18, he would move—"That Dr. Lyon Playfair, Mr. Salt, Mr. Rodwell, Sir Lighted Kay-Shuttleworth, and Mr. Knowles be members of the Select Committee on the Manchester Corporation Water Bill."

SATURDAY, FEB. 16.

Petitions against the Nottingham Improvement, Gas, and Water Bill were presented from (1) St. Ann's Mutual Benefit Building Society and others, (2) Midland Railway Company, (3) Justices of the Peace for the County of Nottingham.

GLASGOW WATER SUPPLY.—Dr. Mills, F.R.S., of Anderson's College, Glasgow, reports that, during last month, the water supplied to the city from Loch Katrine was of a light brown colour, and contained muddy particles and a few flakes.

## Legal Intelligence.

LAMBETH POLICE COURT.—FRIDAY, FEB. 15.

(Before Mr. ELLISON.)

LEAVING WORK WITHOUT NOTICE.

Mr. HOWARD appeared on behalf of the South Metropolitan Gas Company with reference to three summonses taken out against men, who had been in the employ of the Company, for quitting their work without proper notice, whereby the plaintiffs had suffered damage, and claimed compensation. He explained to the Court the extreme inconvenience arising from men in the position of defendants by their suddenly leaving their work. The defendants, however, having returned to their work, and expressed regret for their conduct, the Company had no desire to press the matter. It was only desired that men should know that they were bound to carry out the arrangements they entered into when taken on by the Company, and failing that, they were liable to be prosecuted.

Mr. ELLISON said he quite agreed with the importance of such a matter, and allowed the summonses to be withdrawn.

ALLEGED FRAUDULENT CONNECTION OF PIPES.

Maire Poinbeuf, of 2, Union Road, Clapham, was summoned, at the instance of the Phoenix Gas Company, for having, on or about the 1st of January, unlawfully connected the meter with the pipe through which gas was supplied by the Company, without having given due notice of the intention so to do.

The defendant did not appear, but a person who said his name was Therry came forward in answer to the summons. He addressed the Court in French, and, according to his statement, it appeared that he was not unaware of the matter. The defendant was away in Paris, and had been there over a month.

Mr. Allen, the Chief Inspector of the Company, said the defendant had been supplied with gas up to December last. In consequence of the non-payment of money, the gas was cut off in the ordinary way. One of the Sub-Inspectors went to the house on the 6th inst., and found that the connection had again been made, without the knowledge or consent of the Company, and upwards of 6000 feet of gas consumed. Orders were afterwards given, and the gas cut off from the street.

Mr. ELLISON said no doubt it was a serious matter for the Company, and a very proper case to bring before the Court; but as the defendant was not present he would not convict. He would, however, adjourn the case, in order to enable the Company to take further proceedings.

## Miscellaneous News.

METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS.—At the meeting of the Board on Friday last, a report was presented by the Special Purposes and Sanitary Committee, recommending the appointment of Mr. W. J. Dibdin as Gas Examiner, under the provisions of The Gaslight and Coke Company's Act, 1876, at the testing-place fixed by the Gas Referees in Ladbroke Grove. After some discussion, the matter was referred back to the Committee. It was decided to inform the Vestry of Chelsea, in reply to a letter received from them, that when the London Gas Company apply to Parliament for further powers, the Board will take measures for subjecting the Company to the same regulations, as regards the lighting power of their gas, and other matters, as apply to The Gaslight and Coke Company. A further report of the Committee recommended that the Board of Trade be informed, in reply to their communication on the subject of the proposed alteration of the penalty clauses of the Acts of The Gaslight and Coke, Commercial, and South Metropolitan Gas Companies, that the Board do not object to the addition of the words "not exceeding" to the proposed new clauses, as suggested by the several Companies. The subject was referred to the Works and General Purposes Committee for consideration and report.

Dr. Whitmore's report on the illuminating power, pressure, and quality of the coal gas consumed in the parish of Marylebone during January, and supplied by The Gaslight and Coke Company:—

	Illuminating Power in Sperm Candles.			Mean Pressure in Tenth of an Inch.		Mean Quantity of Sulphur in 100 Cu. Ft.		Mean Quantity of Ammonia in 100 Cu. Ft.		Sulphuretted Hydrogen
	Mean of 25 Obsers.	High-est.	Low-est.	High-est.	Low-est.	Grains.	Grains.			
Gas supplied from the Fulham works . . .	16.62	17.51	15.91	21.11	9.63	—	0.38			No trace
Gas supplied from the Beckton and Bow works . . .	16.72	17.42	16.10	33.27	16.68	—	0.30			No trace
Cannel gas supplied from the Pimlico works . . .	20.55	21.04	19.96	22.11	12.57	—	0.13			No trace
Mean of daily readings of barometer . . .										30.43
" " " thermometer . . .										45.90

\* Each observation consists of ten readings of the photometer, at intervals of one minute.

The mean illuminating power of the three gases consumed in the parish during the month averaged rather more than half a candle beyond the legal standard, the range being about one candle. Once only was the Pimlico gas slightly below the standard, and twice only the cannel gas. Owing to the meter used in testing for sulphur being under repair, the amount of that impurity in the three gases could not be ascertained. As regards ammonia, all the gases may be said to have been almost free from it. The pressure was generally good, and no trace of sulphuretted hydrogen was at any time detected by the ordinary tests.

METROPOLIS WATER SUPPLY.

LAMBETH VESTRY.

At the Meeting of this Vestry on Thursday last, the question of the Metropolitan Board's schemes was brought up for consideration on a proposition by

Mr. H. WHITE, who moved—"That this vestry, while endorsing the recommendations of the various Commissions appointed by Parliament to the effect that the supply of water to the Metropolis should be regulated without reference to the profit to be derived therefrom, disagree with the proposals intended to be presented to Parliament by the Metropolitan Board of Works, whereby, in addition to the purchase of the interests of the existing Water Companies, to be computed upon a valuation, it is proposed to spend many millions of money, to lay down a new and second supply to



the Metropolis, entailing a great increase to the Metropolitan rating, and causing disturbance of all kinds to the roads and footways throughout the Metropolitan area. That the Vestry Clerk be instructed to draw up a petition to the Houses of Parliament embodying these views, and that the borough and county Members be requested to support the prayer thereof; and, further, that a copy of the above be transmitted to the Metropolitan Board of Works, and all Vestries and District Boards in the Metropolis." He considered that both the schemes were unnecessary. He had looked over the Purchase Bill, and could not find one sentence in it indicating the advantage that would accrue to the ratepayers by the Board purchasing the undertakings of the Water Companies. There was nothing showing that there would be a reduction in the charges for the water, nor what the rating powers of the Board would be. The only thing which appeared plainly indicated was that there would be little, if any, improvement in the quality or the quantity of the water, so far as the supplies now in the hands of the Companies were concerned. With reference to the financial part of the scheme, he argued that the estimated expenditure of £25,000,000 would be largely exceeded. As to the second scheme, it was a "fancy scheme," and was opposed to the views of nearly all, if not all the Vestries of the Metropolis, who looked upon it as quite uncalled for. For this experiment (and it could scarcely be called anything else) it was estimated that some 5½ millions would be needed; and there would be an outlay of £250,000 required annually—being more than the whole of the Insurance. Companies received from their fire premiums. A good deal was said about high-pressure service for extinguishing fires; but buildings in this country were constructed very differently from those in America, and the liability to fire was not so great as was supposed. If the second scheme were put into operation, the streets would have to be broken up, and considerable inconvenience to trade would result. Two exhaustive inquiries had taken place in 1867-9 with reference to the water supply of the Metropolis, the essence of which was that the water was of such a character that there was no reasonable ground of complaint. In the Purchase Bill the Board were asking for unlimited powers to spend money. Against this he protested, and urged that the best way would be to compel the Companies to carry out their present obligations. As to the second Bill, it had been hurried on, and had passed a second reading. The Purchase Bill had also been read the first time. In conclusion, he expressed an opinion that the two schemes would involve an expenditure of some £40,000,000.

Mr. HILL said the Vestry would be unanimous that it was desirable the water supply should pass into the hands of a body not receiving a profit upon it, but it was quite another question as to who the new body should be. The conference at the Chamber of Trade were unanimous against the second Bill of the Metropolitan Board of Works, and were antagonistic to the first Bill as brought in by that Board.

Mr. SHARPLEY thought the Vestry should unite with the other parishes in any opposition taken. The slowness of the Metropolitan Board in dealing with the floods in South London contrasted with the undue haste with which the second Bill was being pushed forward.

Mr. AKERMAN said he was opposed to the Metropolitan Board having the control of the water supply. If they ever had it they would be sure to poke their noses into houses in the most arbitrary manner. Besides, the Board were most irresponsible—in fact they would not even attend to Parliament.

Mr. C. WHITE thought the Board were promoting these schemes so as to have a little more patronage at their disposal. Lambeth should combine with other parishes in opposing these Bills. The ratepayers had themselves very much to blame. The Purchase Bill was most unsatisfactory, and the second Bill had been hurried on to avoid its being properly discussed by the Vestries.

Mr. FOWLER supported the resolution. A mistake had been made, he thought, in fixing the standard of pure water too high, and a further mistake was made in requiring a pressure of some 70 to 80 feet. But for these two matters, there would be no necessity for anything else than the supply now afforded by the Companies. In the House of Commons, however, the whole question would be argued out, and he hoped the ratepayers would be properly represented there. As ratepayers they would have *locus standi*, although not as Vestries. Even as Vestries, the question of *locus standi* was more one of precedent than one of principle. In regard to water, the Metropolitan Board of Works were not the Local Authority. The Vestries, being the Sanitary Authority in each district, had in this way a claim to be heard, and he trusted they would be represented by counsel. The general affirmation of the resolution was exceedingly good. The water supply should be as good as possible without a profit being made. In conclusion, he expressed an opinion that the rosy statements as to the cost might be doubled, and be nearer the mark. He did not blame the Metropolitan Board of Works for taking the matter up, seeing that public opinion forced it upon some one to do this; but now that that Board had taken such a step, it rested with the Vestries and the Ratepayers to take care that the body to whom the control of the water supply might be handed should be itself under good control.

Mr. REID thought the Metropolitan Board of Works were in this instance trying to lead public opinion rather than to give expression to it. He asked the Vestry if there were not some motive in the Board pushing forward, as they had done, their second Bill. As to the Purchase Bill, it was undesirable, because it was expensive, and contained no provisions for the protection of the ratepayers. He preferred that the Water Companies should be made to do their duty. With reference to the second Bill, the new supply scheme, there would be opposition in the House as well as from those outside. It was Utopian and impracticable, and would cause great expense and inconvenience. It was a scheme for advancing the whims and caprices of certain engineers, and for draining the pockets of the ratepayers.

Mr. TURNER said he did not suppose there had been any pressure brought to bear upon the 45 middle-aged and old gentlemen at Spring Gardens, but those gentlemen assumed that they were equal to anything—even to filling up vacancies in Her Majesty's Government.

Mr. BENNETT said the Metropolitan Board ought to compel the Water Companies to do their duty, instead of indulging in phantom schemes of their own for acquiring possession of the works.

Mr. FOWLER said the Metropolitan Board had not so much power as the Vestries over the Companies.

The resolution was carried unanimously, and delegates were appointed to represent the Vestry at the St. Pancras conference.

**ST. PANCRAS VESTRY.**—At the Meeting of this Vestry on Wednesday last, a report was presented from the Special Committee in reference to the Metropolitan Board Bills, in which it was stated that the Committee considered the action of the Board of very serious importance, as it pointed to the Vestries and District Boards not being allowed to be heard against any Metropolitan Board scheme however objectionable. They had therefore determined to summon a conference of representatives of Vestries to consider the subject. The course taken by the Committee was approved, and it was resolved to instruct counsel to support a petition to Parliament from the Vestry for *locus standi* to oppose the Water Bills.

**CONFERENCE OF VESTRIES.**—On Friday last a Conference of Delegates from the Metropolitan Vestries, comprising nearly one hundred members, was held at the Vestry Hall of St. Pancras, for the purpose of organizing an opposition to the schemes of the Metropolitan Board, and especially to protest against the attempt of the Board to prevent the Vestries and District Boards having *locus standi* before the Parliamentary Committee on the Bills. The Rev. Canon Spence, Vicar of St. Pancras, was elected to preside. Mr. Watkins, member of the Metropolitan Board for St. Pancras, pointed to the fact of the disunion there has been in the Metropolitan Board itself with regard to these Water Bills, the second, for the new supply, having been carried by a majority of three only. Neither the Vestries nor the Ratepayers had been consulted by the Metropolitan Board, and there was no proof whatever that they were not fully satisfied with the existing water supply. No less than 47 petitions had been presented against these Bills, but the Metropolitan Board had determined, if possible, that only one side should be heard, as they had not only determined to oppose the Vestries and District Boards having *locus standi* before the Committee, but were even endeavouring to shut out the Water Companies from appearing upon their petitions before the Committee. He moved the following resolution:—"That, in the opinion of this meeting, the action taken by the Metropolitan Board of Works in determining to object to the *locus standi* of the Vestries and District Boards of the Metropolis is unjust to such Vestries and District Boards, and ought to be resisted, seeing that the said Board claim for themselves the position of being the Authority for the local management of the Metropolis, and thus ignore the large interests represented by the Vestries and District Boards." The motion was carried. It was also resolved—"That in the opinion of the Conference the Metropolitan Water Supply Bill, which has been introduced into the House of Commons as a private measure, ought at once to be withdrawn, and that the funds of the ratepayers entrusted to the Metropolitan Board of Works ought not to be further used in pressing upon Parliament the consideration of a measure which has been almost universally condemned." It was further determined to instruct counsel to appear before the Parliamentary Committee, and endeavour, if possible, to defeat the nefarious designs of the Metropolitan Board.

**CONSUMERS GRIEVANCES IN SOUTH LONDON.**—On Tuesday last a deputation from a meeting of tradesmen in the borough of Southwark had an interview with the Home Secretary at the House of Commons, in reference to the charges recently made by the Water Companies in the southern districts of the Metropolis. Mr. Edward Clarke alleged that the Companies had raised their demands to a very considerable extent, taking into consideration nothing but the rental of the house to which the water was supplied. Manufacturers had the right to have the water by meterage; but where there was a dwelling attached to the manufactory, the Companies insisted upon their right to charge up to 5 per cent. upon the rental value of the house. This, it was contended, was unjust. The object of the deputation, which represented an Association lately formed, was to ask the Government that, in future, consumers might only be rated for their water supply according to the accommodation they received. Mr. Cross intimated that the justice of the right claimed in the present instance under a private Act would be considered in future legislation.

**UXBRIDGE LOCAL BOARD.**—This Board have lodged a petition in Parliament against the Metropolitan Board Supply Bill, on the ground that Red Hill, Denham, where it is proposed to sink the well and erect the pumping-station, being only about 1½ mile from the pumping-station of the Uxbridge Water-Works, and in the same bed of chalk, the Local Board are advised and believe their supply will be materially diminished, if not entirely destroyed. It will be possible, they say, for the Metropolitan Board to acquire land immediately or nearly adjoining the Uxbridge Works, and that no power is given by the Bill to the Metropolitan Board for supplying the Uxbridge district with water in case of the present supply being wholly or partially cut off by the execution of the works proposed to be authorized. The supply cost upwards of £20,000, and the system of drainage, which is entirely dependent upon it, upwards of £30,000, so that the petitioners feel that they have good ground to ask that provision might be made for their protection.

**METROPOLITAN BOARD OF WORKS.**—At the meeting on Friday last, the Parliamentary Committee, to whom the memorial from tradesmen in the Borough, presented at the previous meeting, was referred, made a report, stating that with regard to the request that the Board would take measures for readjusting the charges for water in the Metropolis, and for providing for the supply by meter to places of business, that the memorialists should be informed that the Board were not in a position at the present time to take any measures in the direction indicated in the memorial. A letter was read from the Chairman of the meeting of delegates, stating that a Committee appointed by them were desirous of an interview with the Parliamentary Committee, to confer with them as to the necessity of delaying the progress of the Board's Water Supply Bills until the opinion of the ratepayers has been expressed. The communication was referred to the Parliamentary Committee, with power to receive a deputation.

The Registrar-General publishes the following returns of the average daily quantity of water supplied by the London Water Companies during the month of January, 1878. According to these, 117,475,799 gallons, or 533,746 cubic metres of water (equal to about as many tons by measure, tons by weight) were supplied daily; or 217 gallons (98·6 decalitres), rather less than a ton by weight, to each house, and 30·6 gallons (13·9 decalitres) to each person, against 29·8 gallons during January, 1877.

COMPANIES.	Number of Houses, &c. supplied in		Aver. Daily Supply of Water in Gallons* during	
	Jan., 1877.	Jan., 1878.	Jan., 1877.	Jan., 1878.
Total supply . . . . .	530,464	541,265	112,205,619	117,475,799
From Thames . . . . .	217,965	254,512	56,521,086	58,480,063
„ Lea and other Sources . . . . .	282,499	286,753	55,684,533	58,995,736
THAMES.				
Chelsea . . . . .	28,737	28,859	6,869,060	7,439,200
West Middlesex . . . . .	48,762	50,200	9,290,314	8,986,942
Southwark and Vauxhall . . . . .	77,800	79,567	17,500,000	18,100,000
Grand Junction . . . . .	37,055	37,910	10,838,962	11,012,121
Lambeth . . . . .	55,611	57,976	12,002,800	12,941,800
LEA AND OTHER SOURCES.				
New River . . . . .	125,100	126,178	25,192,000	26,198,000
East London . . . . .	111,967	115,143	23,802,000	26,033,800
Kent . . . . .	45,432	45,432	6,594,533	6,763,936

\* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for January, 1878, as compared with that for the corresponding month of 1877, shows an increase of 10,891 houses, and of 5,270,180 gallons of water supplied daily.



Dr. Frankland reports as the result of his analyses of the waters supplied to the Metropolis and some of its suburbs during January, that, taking unity to represent the average amount of organic impurity in a given volume of the Kent Company's water during the last nine years, the proportional amount of such impurity in an equal volume of water supplied by each of the other Companies, and by the Tottenham Local Board of Health, was—Tottenham 1·1, Colne Valley 1·1, Kent 1·7, Grand Junction (filtered through spongy iron) 2·2, New River 3·4, East London 3·9, Lambeth 4·5, Southwark 5·2, Chelsea 5·2, West Middlesex 5·9, and Grand Junction 6·3. The water drawn from the Thames by the Chelsea, West Middlesex, Grand Junction, Southwark, and Lambeth Companies was again much polluted by organic matter, and was quite unfit for dietetic purposes, even after the efficient filtration to which it had been subjected before delivery. By filtration by spongy iron, however, the proportion of organic matter was reduced to about one-third, and the hardness to little more than one-half of its original amount. The spongy iron filter had continuously supplied all the drinking water to a family of eleven persons for more than a year, and the sample was drawn from it just before the renewal of the spongy iron. The water of the Lea, though efficiently filtered by the New River and East London Companies, was considerably polluted by organic matter in solution. The only samples of good water examined in January were obtained from deep wells in the chalk. This water was supplied by the Kent and Colne Valley Companies, and by the Tottenham Local Board of Health. It was clear, colourless, palatable, and of most excellent quality for dietetic purposes. That portion of it distributed by the Colne Valley Company, having been softened by Clark's process, was well adapted for washing. Seen through a stratum two feet deep, the water supplied by the Kent and Colne Valley Companies, the Tottenham Local Board, and the Grand Junction Company (after filtration through spongy iron) was clear and colourless; the New River and East London Company's water was clear and nearly colourless; that distributed by the Chelsea, West Middlesex, Southwark, and Lambeth Companies, clear and pale yellow; and that by the Grand Junction Company, clear and yellow.

Results of Analysis expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Mat- ters.	Or- ganic Car- bon.	Or- ganic Nitro- gen.	Ammonia.	Nitrogen, as Ni- trates and Nitrites.	Total combined Nitro- gen.	Chlo- rine.	Total Hard- ness.
Inner Circle.								
Thames—								
Chelsea . . . . .	29·84	·265	·041	0	·242	·283	1·65	20·6
West Middlesex . . . .	36·46	·311	·040	0	·238	·278	1·65	20·3
Southwark and Vauxhall	34·10	·270	·034	0	·263	·297	1·60	21·8
Grand Junction . . . .	30·30	·325	·047	0	·241	·288	1·60	20·1
Ditto, after filtration through spongy iron . .	18·42	·092	·040	·007	·119	·165	1·60	11·1
Lambeth . . . . .	22·41	·230	·036	0	·291	·327	1·65	22·8
Other Sources—								
New River . . . . .	30·78	·175	·028	0	·303	·421	1·60	22·4
East London . . . . .	34·64	·194	·038	0	·341	·369	2·00	23·9
Kent . . . . .	44·88	·080	·023	0	·533	·556	2·55	29·4
Outer Circle.								
Colne Valley . . . . .	12·14	·051	·015	0	·342	·347	1·35	4·8
Tottenham Bd. of Health.	15·68	·052	·011	0	·488	·499	3·40	26·5
Corporation of Birmingham* . . . . .	26·30	·248	·079	·004	·341	·423	1·9	16·0
Corporation of Glasgow† . . . . .	3·10	·215	·021	0	·005	·026	0·53	1·2

\* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.  
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.  
Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly Ordinary General Meeting of the Proprietors of this Company was held at the Office, Horseferry Road, Westminster, on Friday last, the 15th inst.—the Hon. HOWE BROWNE, the Governor, presiding.

The SECRETARY (Mr. J. O. Phillips) read the advertisement convening the meeting, and the corporate seal was affixed to the register.

Mr. BADDELEY asked how many Shareholders there were in the Company.

The GOVERNOR: Eight thousand.  
The SECRETARY read the minutes of the last half-yearly general meeting, which were approved.

The following report and statements of account were submitted:—

The period embraced by the accounts which the Directors now submit to the Proprietors has, with slight exception, been of an uneventful character, and has been marked chiefly by steady progress and prosperity. The Company are bound, under penalties, to supply gas of a fixed illuminating power; and the faithfulness with which its duty to the public has been performed is evidenced by the fact that, during a period of seven years, no forfeiture has been incurred. On a recent occasion, however, and owing to circumstances which the Directors have been unable to trace to their origin, the gas delivered from one of their stations was reported by the Government Testing Officer as

Dr. Whitmore's report on the composition of Thames Companies and other waters consumed in Marylebone during January:—

	In Grains, per Gallon.		In Parts, per Million.		In Degrees.	
	Total Solid Matter.	Loss by Incineration.	Chlorine.	Free Ammonia.	Albumenoid Ammonia.	Hardness after boiling Fifteen Minutes.
West Middlesex . . . .	20·00	0·96	1·04	0·02	0·06	14·0
Grand Junction . . . .	21·28	0·96	1·10	0·02	0·07	14·7

• The loss by incineration represents the amount of organic and other volatile matters contained in the Imperial gallon (70,000 grains) of water. The total solid matter, minus such loss, consisted principally of carbonate of lime, with small quantities of other equally harmless salts.

The water of both Companies, as drawn from the mains, when seen through a glass tube, showing a volume of water two feet in thickness, was clear, bright, and nearly colourless. The water taken from the Thames at Hampton was turbid.

WATER SUPPLY OF TOWNS.

His Royal Highness the Prince of Wales, President of the Society of Arts, has addressed the following letter to the Council of that body:—

“Clarence House, St. James's, S.W., Jan. 30, 1878.

“To the Chairman of the Council of the Society of Arts.

“Sir,—The supply of pure water to the population is at the present time exciting deep interest throughout the country. Our great cities and populous towns, such as Manchester, Liverpool, Birmingham, and others, are, each for itself, taking steps to obtain an improved and increased supply, whilst the Metropolis is seeking further powers from the Legislature with the same object in view. The smaller towns and villages are dependent upon accidental sources of supply, and in many instances these are wholly inadequate for health and comfort. While the larger populations are striving, each independently and at enormous cost, to secure for themselves this article of prime necessity, the smaller localities must make the best shift they can, and in many instances are all but without supply at all.

“Under these circumstances, I would draw the attention of the Council to the subject, and suggest whether, at the present time, great public good would not arise from an open discussion of the question in the Society's rooms, with a view to the consideration of how far the great natural resources of the kingdom might, by some large and comprehensive scheme of a national character, adapted to the varying specialities and wants of districts, be turned to account, for the benefit, not merely of a few large centres of population, but for the advantage of the general body of the nation at large.—I have the honour to be, Sir, yours faithfully,

(Signed) “ALBERT EDWARD P.,

“President of the Society of Arts.”

This communication was laid before the Council at their last meeting, and it was resolved that a Committee be formed to consider the best means of carrying into effect the proposition of the Prince of Wales, and that the Secretary be desired to inform His Royal Highness that the Council would take immediate steps to secure the discussion of the subject as suggested.

The following is the reply sent in accordance with these instructions:—

“Society of Arts, John Street, Adelphi, W.C., Feb. 13, 1878.

“Sir,—I am directed by the Council of this Society to acknowledge the receipt of your Royal Highness's letter of the 30th of January, addressed to the Chairman, and to express to your Royal Highness their high estimation of the importance of the subject which your Royal Highness has brought to their consideration. It will afford the Council much gratification to carry out your Royal Highness's most valuable suggestion, and they will at once take steps for securing a public discussion on this subject.—I have the honour to be, Sir, your Royal Highness's most obedient servant, (Signed) “P. LE NEVE FOSTER, Secretary.”

No. 1.—STATEMENT OF STOCK AND SHARE CAPITAL, on Dec. 31, 1877.

Acts of Parliament relating to the raising of Capital.	Description of Capital.	Standard Dividend.	Number of Shares issued.	Nominal Amount of Shares.	Called up per Share.	Total paid up.	Arrears of Calls.	Remaining to be called up and unpaid.	Total Amount authorized.
The Gaslight and Coke Company's Act, 1868 . . . . .	A Ordinary stock . . . . .	10 per cent.	..	..	..	£1,535,820	..	..	£
	A Preference convertible stock, 1st issue . . . .	5 ..	..	..	..	2,140	..	..	1,550,000
	Ditto, 2nd issue . . . . .	Ditto.	..	..	..	2,530	..	..	
The Gaslight and Coke Company's Act, 1872 . . . . .	A Preference convertible shares, 3rd issue . . . .	Ditto.	951	£10	£10	9,510	..	..	1,000,000
	Ditto, 4th issue . . . . .	Ditto.	50,000	10	10	500,000	..	..	
	Ditto, 5th issue . . . . .	Ditto.	50,000	10	4	198,854	£1116	£300,000	
The Victoria Docks Gas Act, 1857. . . . .	A Ordinary stock . . . . .	10 per cent.	..	..	..	100,000	..	..	100,000
The City of London Gas Company's Act, 1859 . . . . .	A .. .. .	Ditto.	..	..	..	300,000	..	..	400,000
The Companies Act, 1862, as applied to the Western Gaslight Company, Limited. . . . .	B Stock .. .. .	4 per cent.	..	..	..	100,000	..	..	600,000
The Imperial Gas Act, 1854. . . . .	A Ordinary stock . . . . .	10 ..	..	..	..	600,000	..	..	
The Great Central Gas Consumers Act, 1851 . . . . .	A .. .. .	Ditto.	..	..	..	1,560,000	..	..	
The Equitable Gaslight Company's Act, 1842 . . . . .	C Preference stock . . . .	Ditto.	..	..	..	200,000	..	..	200,000
The Independent Gaslight and Coke Co.'s Act, 1864 . . . . .	D .. .. .	Ditto.	..	..	..	300,000	..	..	300,000
	E .. .. .	Ditto.	..	..	..	165,000	..	..	255,000
	F .. .. .	5 per cent.	..	..	..	50,000	..	..	
The Imperial Gas Act, 1866. . . . .	G .. .. .	7 ..	..	..	..	60,000	..	..	325,000
The Imperial Gas Act, 1869. . . . .	H Stock .. .. .	Ditto.	..	..	..	325,000	..	..	
The Gaslight and Coke Company's Act, 1876 . . . . .	Ditto .. .. .	10 per cent.	..	..	..	975,000	..	..	975,000
							1,000,000		1,000,000
							£6,963,854	£1116	£1,300,000
									£8,265,000



No. 2.—STATEMENT OF LOAN CAPITAL.

Acts of Parliament authorizing the Loan Capital.	Total Amount authorized.	Description of Loan.	RATES PER CENT. OF INTEREST.					Total Amount borrowed.	Remaining to be borrowed.
			4 per Cent.	4½ per Cent.	4¼ per Cent.	4½ per Cent.	10 per Cent.		
The Gaslight and Coke Company's Act, 1868.	£162,500	Debentures. Debenture stock. Bonds for capitalized profits.	£6,300	£20,000	£110,000	£500,650	..	£1,436,500	£125,000
The City of London Gas Company's Act, 1859	60,000		354,200	..	50,000	265,350	..		
The Great Central Gas Consumers Act, 1851	66,000		..	..	..	..	..		
The Victoria Docks Gas Act, 1857	25,000		..	..	..	..	..		
The Companies Act, 1862, as applied to the Western Gaslight Company, Limited	200,000		..	..	..	..	£130,000		
The Imperial Gas Act, 1854	173,000	..	..	..	..	..	..	..	1,000,000
The Imperial Gas Act, 1866	81,250		..	..	..	..	..		
The Imperial Gas Act, 1869	243,750		..	..	..	..	..		
The Gaslight and Coke Company's Act, 1872	250,000		..	..	..	..	..		
The Gaslight and Coke Company's Act, 1876	1,000,000	..	..	..	..	..	..	..	..
	£2,661,500		£360,500	£20,000	£160,000	£766,000	£130,000	£1,436,500	£1,125,000

Dr.

No. 3.—CAPITAL ACCOUNT.

Cr.

	Expended this Half Year.	Total Expenditure to Dec. 31, 1877.		Receipts to June 30, 1877.	Received since that date.	Total Receipts to Dec. 31, 1877.
To Expenditure to June 30, 1877	£ s. d.	£ s. d.	By A Ordinary stock	£ s. d.	£ s. d.	£ s. d.
Expenditure during half year to Dec. 31, 1877—viz.:	..	7,782,275 4 5	A 5 per cent. preference convertible stock	4,094,840 0 0	..	4,095,820 0 0
Lands acquired, including law charges	15,142 11 8		A 5 per cent. preference convertible stock, 2nd issue	2,140 0 0	..	2,140 0 0
Buildings and machinery in extension of works	145,439 4 1		A 5 per cent. preference shares, 3rd issue	*2,940 0 0	..	2,530 0 0
New and additional mains and service-pipes	29,257 11 6		A 5 per cent. preference shares, 4th issue	*10,050 0 0	..	9,510 0 0
New and additional meters	7,222 9 6		A 5 per cent. preference shares, 5th issue	300,000 0 0	200,000 0 0	500,000 0 0
		197,061 16 9	A 5 per cent. preference shares, 6th issue	100,000 0 0	98,854 0 0	198,854 0 0
			B 4 per cent. maximum stock	100,000 0 0	..	100,000 0 0
			C 10 per cent. preference stock	200,000 0 0	..	200,000 0 0
			D 10 " " "	300,000 0 0	..	300,000 0 0
			E 10 " " "	165,000 0 0	..	165,000 0 0
			F 5 " " "	30,000 0 0	..	30,000 0 0
			G 7½ " " "	60,000 0 0	..	60,000 0 0
			H 7 per cent. maximum stock	1,300,000 0 0	..	1,300,000 0 0
			Debentures	*706,950 0 0	..	636,950 0 0
			Debenture stock, 4½ per cent.	265,350 0 0	..	265,350 0 0
			" " 4¼ " "	50,000 0 0	..	50,000 0 0
			" " 4 " "	*284,200 0 0	..	354,200 0 0
			Bonds for capitalized profits	130,000 0 0	..	130,000 0 0
				8,101,500 0 0	298,854 0 0	
To Balance of capital account		7,979,337 1 2	* £980 of these issues have been converted into ordinary stock during the half year.			
		421,016 18 10	+ Debentures, amounting to £70,000, have been exchanged for debenture stock during the half year.			
		8,400,354 0 0				8,460,354 0 0

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—	£ s. d.	£ s. d.	By Sale of gas—	£ s. d.	£ s. d.
Coals, including dues, carriage, unloading, and trimming (see Account No. 9)	407,736 8 11		Common gas, per meter, at 3s. 6d. per 1000 cubic feet	775,386 0 2	
Salaries of engineers and other officers at works	6,185 8 4		Cannel gas, per meter, at 4s. 4d. per 1000 cubic feet	48,060 11 6	
Wages (carbonizing)	73,904 4 6		Cannel gas, sold in bulk, at 3s. 5d. per 1000 cubic feet	4,199 0 1	
Purification, including £11,131 6s. 2d. for labour	17,821 15 0		Public lighting and under contracts—		
Repair and maintenance of works and plant, materials and labour; less received for old materials, £2018 17s. 5d.	112,084 12 3	617,732 9 0	Common gas	60,145 13 7	
			Cannel gas	4,934 10 8	892,725 18 0
			(see Statement No. 11)		17,137 19 6
Distribution of gas—			Rental of meters	..	
Salaries and wages of officers (including rental clerks)	17,161 11 7		Residual products—		
Repair, maintenance, and renewal of mains and service-pipes	20,922 10 1		Coke, less £18,312 5s. 9d. for labour, &c.	145,866 2 10	
Repairs and renewals of meters	14,054 13 2	52,138 14 10	Breeze, less £1755 7s. 10d. for ditto	1,754 6 11	
			Tar, less £282 16s. 9d. for ditto	46,847 6 2	
Public lamps—			Ammoniacal liquor, less £297 9s. 6d. for ditto	45,397 14 3	239,865 10 2
Lighting and repairing	..	11,068 15 9			2,319 2 2
			Rents receivable	..	217 10 0
Rents, rates, and taxes—			Transfer fees	..	179 11 1
Rents payable	4,917 19 7		Canteen account	..	
Rates and taxes	27,901 0 1	32,818 19 8			
Management—					
Directors allowance	3,750 0 0				
Company's auditors	250 0 0				
Salaries of secretary, accountant, and clerks	5,451 10 10				
Collectors commission	11,607 1 8				
Stationery and printing	4,629 3 5				
General charges	1,649 13 6	27,337 9 5			
Law charges	..	4,921 12 0			
Parliamentary charges	..	9 13 2			
Bad debts	..	3,921 12 2			
Depreciation-fund, for works on leasehold lands	..	750 0 0			
Superannuation allowances under amalgamation schemes, and annuities	..	8,604 14 4			
Public officers—					
Gas referees and official auditor	969 16 4				
Public testing-stations	181 16 4	1,151 12 8			
		760,455 13 0			
Balance carried to net revenue account (No. 5)	..	391,989 17 11			
		1,152,445 10 11			1,152,445 10 11

No. 5.—NET REVENUE ACCOUNT.

To Interest on debentures, debenture stocks, and bonds, accrued to Dec. 31, 1877	£ s. d.	£ s. d.	By Balance from last account	£ s. d.	£ s. d.
Dividend on A 5 per cent. preference shares and stock	11,521 3 4	34,772 8 9	Less dividend on ordinary capital for the half year to June 30, 1877	272,981 14 8	
Dividend on B stock, at 4 per cent.	2,000 0 0			204,742 0 0	68,239 14 8
" C " 10 " "	10,000 0 0		Revenue account (No. 4)	..	391,989 17 11
" D " 10 " "	15,000 0 0		Dividend from the estate of Benjamin Higgs	..	63 8 0
" E " 10 " "	8,250 0 0				
" F " 5 " "	750 0 0				
" G " 7½ " "	2,250 0 0				
" H " 7 " "	45,500 0 0	98,271 3 4			
Interest on temporary loans	..	712 12 4			
Balance applicable to dividend on the ordinary stock	..	326,536 16 2			
		460,293 0 7			460,293 0 7



No. 6.—RESERVE-FUND ACCOUNT.

Balance, Dec. 31, 1877 . .	£103,382	5	4	Balance, June 30, 1877 . .	£101,753	5	2
				Interest on amount invested	1,629	0	2
	<u>£103,382</u>	<u>5</u>	<u>4</u>		<u>£103,382</u>	<u>5</u>	<u>4</u>

No. 7.—INSURANCE-FUND ACCOUNT.

Balance, Dec. 31, 1877 . .	£71,973	11	7	Balance, June 30, 1877 . .	£70,852	3	2
				Interest on amount invested	1,121	8	5
	<u>£71,973</u>	<u>11</u>	<u>7</u>		<u>£71,973</u>	<u>11</u>	<u>7</u>

No. 8.—DEPRECIATION-FUND ACCOUNT (FOR WORKS ON LEASEHOLD LANDS).

Balance, Dec. 31, 1877 . . .	£9,704 9 6	Balance, June 30, 1877 . . .	£8,827 19 7
		Amount brought from revenue account for the half year . . . . .	750 0 0
		Interest on amount invested . . . . .	126 9 11
	<u>£9,704 9 6</u>		<u>£9,704 9 6</u>

NO. 9.—STATEMENT OF COALS USED, ETC.

Description of Coal.	In Store, June 30, 1877.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, Dec. 31, 1877.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	71,284	539,332	492,079	327	118,210
Cannel . . . . .	18,339	28,716	29,461	..	17,591

No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

Description of Residual.	In Store, June 30, 1877.	Made during Half Year.	Used in Manufacture during Half Year.	Sold during Half Year.	In Store Dec. 31, 1877.
Coke—chaldrons. . . . .	32,917	491,989	135,678	317,506	41,752
Breeze—chaldrons . . . . .	745	47,624	..	46,705	1,664
Tar—gallons . . . . .	1,112,152	5,248,731	..	5,350,650	1,331,533
Ammoniacal liquor—butts of 105 gallons . . . . .	4,550	151,290	..	146,026	9,814

No. 11.—STATEMENT OF GAS MADE, SOLD, ETC.

Description of Gas.	Quantity Made (part measured).	QUANTITY SOLD.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common Cannel . . . . .	5,128,250	289,565	4,430,777	4,720,342	61,682	4,782,024	346,226	31,464
	276,948	17,754	*246,398	264,152	1,326	265,478	11,470	3,380

\* This includes the quantity sold in bulk.

### GENERAL BALANCE-SHEET.

	£	s.	d.		£	s.	d.		£	s.	d.
To Capital—				By Cash at bankers . . . . .	..				76,244	13	11
Balance at credit thereof (Account No. 3) . . . . .	421,016	18	10	Amount invested—							
Net revenue—				Reduced Three per Cent. Consols . . . . .	103,382	5	4				
Balance at credit thereof (Account No. 5) . . . . .	326,536	16	2	Three per Cent. Consols . . . . .	71,973	11	7				
Reserve-fund account—				New Three per Cent. Consols . . . . .	9,704	9	6				
Balance at credit thereof (Account No. 6) . . . . .	103,382	5	4						185,060	6	5
Insurance-fund account—				Stores on hand, viz.—							
Balance at credit thereof (Account No. 7) . . . . .	71,973	11	7	Coals . . . . .	118,780	19	10				
Depreciation-fund account—				Coke . . . . .	13,196	11	0				
Balance at credit thereof (Account No. 8) . . . . .	9,704	9	6	Tar and ammoniacal liquor . . . . .	11,500	6	9				
Debtenture interest for amount due to Dec. 31, 1877 . . . . .	26,381	6	11	Sundry stores . . . . .	99,762	6	11				
Bond interest for amount due to ditto . . . . .	6,500	0	0						218,230	4	6
Preference dividends for amount due to ditto . . . . .	98,271	3	4	Accounts due to the Company, viz.—							
Unclaimed dividends . . . . .	5,757	0	7	Gas and meter rental . . . . .	632,277	5	2				
Sundry tradesmen and others, for amount due for coals, stores, and sundries . . . . .	156,651	0	1	Quarter ending Dec. 31, 1877 . . . . .	10,010	11	9				
Benevolent-fund . . . . .	1,552	4	0	Arrears outstanding . . . . .					612,287	16	11
Debtenture stock subscriptions . . . . .	51,090	0	0								
				Coke and other residual products . . . . .	57,837	3	5				
				Sundry accounts . . . . .	40,611	11	2				
									98,451	11	7
				Retiring allowances . . . . .	..				28,512	0	0
	1,278,816	16	4						1,278,816	16	

Examined and found correct, Jan. 30, 1878.

(Signed) J. SALE BARKER, H. W. CHISHOLM, T. J. BRIGGS, FRANCIS FARNAN, Auditors.

I certify that the above accounts are correct. A forfeiture incurred during the half year, amounting to £74, must be borne and paid exclusively by and out of the divisible profits of the Company, and by way of reduction of dividend.

(Signed) CHAS. H. PARKES, Official Auditor.

Feb. 1. 1878.

(Signed)

CHAS. H. PARKES, Official Auditor.

THE GOVERNOR: Gentlemen, it now becomes my duty to move the adoption of the report and statements of account which are in your hands, and to which, no doubt, you have already given considerable attention. In doing so, I must, in the first place, express the pleasure I feel in seeing so large an attendance here to-day, and also the hope that I shall be able to make myself more clearly audible than it was my unfortunate fate at the last general meeting to do. We have altered the situation of the platform, and I think probably from that circumstance and the different arrangement made as to the drapery of this large hall, you will be better able to hear me than you could do on the last occasion. Gentlemen, I shall have very few remarks to make upon the report itself. It is very short; but there are one or two points in it which require a little attention from the proprietors. And, first of all, as to the fine which has been levied upon us, for a very small offence, at the instance of the Metropolitan Board of Works. That offence, as mentioned in the report, was a want of illuminating power in the gas supplied from one of our stations during a very short period. We have been unable ourselves exactly to account for the cause of that decrease; it was not perceptible at the station itself, and must have taken place between the station and the testing office. At that office, however, the gas was found by the Examiner to be one candle deficient in illuminating power, and our worthy friends, the Metropolitan Board of Works, seized upon the opportunity to inflict upon us a fine of £74. Now, I am not going to express a very strong opinion upon the conduct of the Metropolitan Board in instituting these proceedings. I merely state the fact to the proprietors; but I cannot help thinking that, after having served the City of London and the Metropolis generally for seven years, without on any single occasion having rendered ourselves liable to an indictment of this kind, for want of illuminating power in our gas, it is a very miserable and paltry proceeding on the part of a great body like the Metropolitan Board, to take the advantage they did of us on this occasion. I wish also to state that, during the seven years we have been supplying something like two-thirds of the Metropolis, we have been giving the consumers, and the public generally, gas of an illuminating power fully one candle above the requirements of our Act of Parliament—an excess, the value of which worked out in money, as I have had it done, would astonish you. We are not paid for that excess, and we get no credit for it from the Metropolitan Board. I may mention, in reference to the instance in which we were recently fined, that the Magistrate who tried the case, marked his sense of the unfairness, or, rather, the paltriness, of the whole proceeding, and inflicted a strong rebuke upon the Metropolitan Board, who applied to be paid their costs, amounting to £10, by awarding them 2s. only. Now, gentlemen, the next point in the report to which I wish to allude, is the apparently very large balance which we are carrying over to the next account. And here I may say that, on the first occasion upon which the amalgamated Company met here, I clearly enunciated the policy which was then most warmly received by the proprietors as the policy for the future—viz., in the first place to accumulate as large a reserve-fund as we are enabled to do under our Act; and, secondly, not to

increase our dividends beyond 10 per cent. until we had thus established a satisfactory reserve. Suggestions have been made that we should increase our dividends, or that we should pay the dividends clear of income-tax, and not carry over so large a surplus on this occasion. But I wish to mention to the proprietors that in the next year—1879—and in the succeeding year—1880—we shall be called upon to pay a very largely increased dividend on the fourth and fifth issues of our convertible shares, which will then come in and rank with the ordinary 10 per cent. A stock This will entail upon us an amount of, say, £50,000 in the two years, and to provide against that, and keep us in a proper working condition, the Board are unanimous in suggesting to you that the accounts, as rendered to you, should stand, and that the amount to be carried forward should remain as it is. Now, gentlemen, going away from the report, I may mention to you that this Company have been indicted for creating a nuisance with their spent lime at the Bromley station, and an injunction was obtained against us, from Justice Fry, to restrain the manufacture of gas there under certain conditions, but the execution of the injunction was stayed for three months, with the understanding on the part of the Company that we should take every means in our power to mitigate that nuisance, and entirely to obviate it if possible. The principal ground upon which the injunction was given was the importation into that station of spent lime from other stations, which certainly caused a nuisance, and it must be confessed that, after our contentions in Parliament last session, we had a very lame defence to the action. We were, therefore, very glad to accept the conditions imposed by Justice Fry, who stayed the injunction for three months. During that period I have great pleasure in stating the gratifying fact to the proprietors that we have introduced at that station a new system of purification of the spent lime, which has completely removed the nuisance. During these three months we have had but three complaints, two of which were completely groundless, and the third may be traceable to other sources than our works, so that I believe I may say with confidence that we shall hear no more of this matter. The period during which the injunction was suspended ceases to-morrow. I wish it had been yesterday, for then I should have had the pleasure of announcing that the question was now altogether at an end. In reference to this question of purification, I hope the day is not very far distant when we may congratulate ourselves on the total disuse of lime, or its almost total disuse, as a purifying agent. I am not in a position at the present moment to state, nor would I state it without further experience, the result of experiments now going on in the works of this Company for bringing about a completely new system of purification from sulphur. But I hope at the next meeting to be able to do so. Our position at the present moment is this—that, having already seen it experimentally tried, we have now determined to put one of our stations completely under this new system, and in a very few days the station I allude to—Silvertown—will be adopting entirely the new process. Hitherto it has given us every promise of success, and I believe firmly, having seen it frequently myself—the other members of the Board also believe with me—that it will prove a most



valuable and important improvement, so that by-and-by we may hope to be able to avert any kind of indictment for nuisance arising from the use of lime on our works. It will also be a much more economical process than that which is now in operation. The tar and sulphur works at Beckton have been commenced, and we trust they will be productive of great profit to this Company. We do not anticipate for the first year or two that they will be as remunerative as they will be afterwards, on account of the opposition we may have to meet with, but ultimately, I have no doubt in my own mind, and I believe no doubt exists in the minds of the majority of our Board, that a considerable profit will accrue to the Company from the utilization and manufacture of our own products by ourselves. Now, the next point I allude to is a most important one. It is not mentioned in the report, because it was thought better to leave it to me to explain to the proprietors to-day. I refer to the action which was brought by Mr. Patterson against this Company as long ago as the year 1873. Having been a Gas Referee, and consequently having access to all our works, and being able to investigate all our processes, he discovered, or fancied he discovered, some improvement in the mode of purifying gas, for which he took out a patent. If he had succeeded in establishing that patent, he would have been able to inflict upon us an enormous expense in the shape of royalties for the use of the process. As it is, he has put us to an enormous expense. In the first place, he brought an action against us for the infringement of his patent, which was tried before Vice-Chancellor Bacon, who gave everything in his favour. Advised, as we were, by the very best counsel we could possibly engage—viz., Mr. Southgate and Mr. Horace Davey—we appealed against that decision to the Lords Justices of Appeal. Those learned judges, the highest in their profession, gave every single point in our favour, thus reversing the decision of Vice-Chancellor Bacon, and they gave the costs in our favour. A year, or perhaps more than a year, was then allowed to Mr. Patterson to bring this matter forward again before the House of Lords, thus inflicting additional expense upon the Company, for he was allowed to sue us before that tribunal *in forma pauperis*—i.e., he conducted his own case, and was not subject to any costs whatever, whereas we, as a Company, were obliged to employ the very best counsel we could get (who were the same that we had before) to defend our rights. I am glad, however, to inform you that the decision of the House of Lords was unanimously in favour of this Company, although, under the circumstances, we are mulcted in the costs of these actions—which I call most unrighteous actions—to the extent of £12,065! The balance of that amount is charged in the present accounts; and, therefore, we do not owe one shilling on that behalf. The costs also of the West Ham prosecution are included in the present accounts, where law charges figure in the sum of £4921. We have done now, I hope, with Mr. Patterson for ever, and I think the proprietors will agree that we, the Directors, have taken the soundest possible course in resisting his claim to the uttermost. If we had not succeeded in our resistance, it would have entailed upon us an amount of annual expense which I could hardly estimate, considering the vast operations of the Company, and, therefore, we may congratulate ourselves that, as far as this matter is concerned, we are out of the wood. Now, gentlemen, having troubled you at such great length at the last meeting on the subject of the electric light, I am almost afraid to venture upon any further observations with regard to it to-day. I may say, however, that at Christmas last, for my own information and satisfaction, I went to Paris, and saw the whole operation of the electric light as there manufactured. Since then I have been requested, by a letter from the gentlemen who so very courteously and so very graciously received me there—the patentees of the light—to express my opinion as to its applicability in the sense of its chance of superseding illumination by coal gas. I replied to their communication by saying that I should certainly allude to it in my address to-day, out of compliment to them, for they fully deserve it; and I told them at the same time that the result of my experience and observation in Paris was not to change the opinion I had originally formed upon this very important question. I told them that the same objection to the system still existed in my mind—viz., the difficulty attending the distribution of the light. There is no doubt in the world it is a beautiful and splendid light; but its intensity is so great that I do not think it can ever come into general use in dwelling-houses. But, while saying this, I will not conceal the fact that great improvements are being made in the light, and I should be the very last person in the world to deprive those gentlemen of the praise which is due to them for the great improvements they have effected. The light which I witnessed in Paris is a different light from that which I described at the last meeting. It is not Jablockhoff's light; it is a light which dispenses with the use of a candle, and this, in itself, is a great improvement. These gentlemen showed me everything, from the beginning to the end, in their laboratory, a very large apartment, where there was a large assemblage of scientific men, and where they took every possible pains to explain the machinery and the light itself, down to the very last point. My great objection to the light is that it is not a flame; it is a succession of sparks, which are most dazzling to the eyes, and very painful, as I afterwards experienced. But for some purposes I do not hesitate to state that it will be applicable. I think it will be applicable in a shape that will not at all interfere with, but rather augment, the profits of gas companies, because the production of this light necessitates the employment of power, which power cannot in any way be so inexpensively obtained as by the use of a gas-engine. They told me so in Paris; they said, "Though we may seem to interfere with you, we shall, in fact, be your best customers." I say that in some cases, as in the illumination of large open spaces, this light may succeed. In lighthouses it ought to be used, as it is a remarkably brilliant light. There is a very curious circumstance in connection with this light, which I took the trouble to satisfy myself about when in Paris. It is this—that after having stood under one of these electric lights, if you go and stand under a gas-lamp, you can read better beneath the latter than the former. On Christmas-day last I satisfied myself on this point, and I found that though from the Place Vendôme I could see with the greatest possible distinctness every other lamp, still when I came near the electric light I could not distinguish the print of a newspaper at all better than when under a gas-lamp. I am quite sure I wish these gentlemen every success in their invention. They do not at all contemplate, as they told me, that they will interfere with gas illumination; and, for my own part, I believe that as to its applicability in private houses it is perfectly impossible. Now, passing from these subjects, I wish to call attention to the present state of the working of this Company. At our last meeting I think I used the expression that, since my connection with the Chartered Company, I had never known it to be in a more progressively improving condition than it then was. I am glad to say that since that time the statement I then made has been fully carried out and realized. I will just read a few statistics to show how we are going on. During the half year ending December last we carbonized 521,540 tons of coal, and during the whole of 1877 we carbonized 1,011,233 tons. We have now brought our working to that state, I may almost say of perfection (for you cannot get out of a ton of coal more than a ton of coal contains) that the gas made per ton of coal carbonized at all our stations during the December half year was 10,364 cubic feet. I do not think that state of things can be equalled by any

other Company in existence. As compared with our make in 1876, which was 10,140 feet per ton, there was an improvement and increase to the extent of 220 feet per ton. I think this reflects the greatest possible credit upon our engineers, and it shows the very strict vigilance which the Board maintain as to the working of every station. At some stations, of course, there are discrepancies, but these are accounted for by the position of the stations themselves, and from their relative antiquity or newness of construction, and more particularly with reference to the delivery of coals into those stations. For instance, at Beckton, we show the extraordinary result of 10,800 feet of gas produced per ton of coal. This, of course, merges in the average of all the stations which are not so good as Beckton. Bromley and Beckton are peculiarly well situated for getting coal newly wrought from the pits, and naturally the production of those stations is in a greater degree than that of other stations in less favourable positions. But, on the whole, I think, when I state that the average of all the stations amounts to 10,364 feet of gas per ton, it must be considered satisfactory by the proprietors. Now as to the amount of gas sold. We realized 92.21 per cent., which is an extraordinary result. We used upon our stations 1.17 per cent. Our loss by unaccounted-for gas last half year was somewhat—but only to a small degree—higher than in the previous period; and for this reason—that during the last half year, as every one knows, there have been great changes in the City, in the pulling down of streets, and the discontinuance of lights from that cause, and this has tended to increase the amount of our unaccounted-for gas. But after all it was only increased from 6.54 to 6.62 per cent., which is a very small item. The average price of coke has been, as we expected, decreased on account of the continued mildness of the weather, there having been almost a glut of coke in the London market. I do not suppose any Company ever experienced two such mild winters as we have passed through, and consequently the price of coke has diminished. The bad debts of this Company are only .43 per cent. on the rental—i.e., about 9s. in the £100—which, I think, is highly satisfactory, and reflects great credit on the mode of collection we have adopted. The increase in the gas sold during the half year is close upon 6 per cent., and I am sure it would have been greater had it not been for the extraordinary depression in trade which every one hears of, and which exceeds in intensity that of any former period in our memories, and has continued for a much longer space of time. It is prevalent throughout the whole country in every department of business, and, therefore, I think it is very satisfactory that this Company are able to show an increase in the per centage of gas sold to their consumers, equal to what it was my duty once to give evidence upon in the House of Lords, when I stated that the annual increase in the consumption of gas was between 5 and 6 per cent. This, I think, is highly satisfactory, considering that the price of gas has been diminished during the year. As regards the future, I feel that I may speak with a tolerable degree of certainty. The Directors have been enabled to make very fair contracts for their coals during the coming year, and I believe we shall have to congratulate ourselves at the close that those contracts have been very beneficial to the Company. I will not mention the exact price at which we have made contracts, because I do not think it desirable to do so. I may now just refer to the future calls to be made upon our fifth issue. You are aware that the calls on the fourth issue are now completed. The full amount is paid up on every one of those shares, and there is a third call now made on the fifth issue, which is due next month. In all probability—I do not say it is certain—we shall have to call up, for our present commitments, for contracts and extensions of works, in October and January next, the remaining two calls upon the fifth capital. We shall then have exhausted our powers as to those two issues, and I believe I am correct in saying that the amount derivable from those calls will be sufficient to cover all our present contracts for enlarging works, gasholders, &c., which we must provide for, in view of the very large increase in the consumption of gas which we are led to expect, and which must result from the increase in the population of London, and from the greatly increased area of our operations in the suburban districts. Gentlemen who have visited Kensington, and that portion of London, lately, must have observed the enormous extension of building that is taking place, in South Kensington particularly, also in the direction of Kensal Green. There is no doubt that, in the course of a few years, the whole of that ground will be covered with houses, and the Chartered Company will have to supply them with gas. It is, therefore, satisfactory to know that these two calls, when made, will most likely be sufficient for our present needs, without touching upon the capital we are entitled to raise under our Act of 1876—£1,000,000—and which, when issued, we shall be obliged to offer to the public by auction, though I dare say, when such is the case, you will be very glad to compete for it. However, we shall not have to touch that, I hope, for more than a year. We are about to ask power at this meeting, as stated in the notice convening it, to raise, by the creation and issue of debenture stock, the sum of £125,000, which we are entitled to do in consideration of the amount paid up on the fourth and fifth issues of preference shares. We have offered this stock to the Proprietors, in the first instance, at the rate of 4 per cent., and I am happy to say that, even up to the present moment, of the £125,000 which we propose to raise, upwards of £90,000 have been applied for, and I have no doubt we shall get applications for a great deal more than we require, even at this very low rate of interest. I advert to this as a subject matter of congratulation, for I was shown a letter the other day from a proprietor, complaining dreadfully of the stinginess of the Directors in not offering this stock at 5 per cent. interest instead of 4, thus putting a small bonus into the pockets of the Proprietors. The simple answer to that complaint is this—would you, in your own business, raise money at 5 per cent. when you could get it at 4 per cent.? This stock is debenture stock, irredeemable for ever, and by issuing it at 5 per cent., we should encumber this Company with an enormous annual outlay, whereas it is evident the Public and the Proprietors are most willing to take it at 4 per cent. I think the Proprietors will agree with the Board that the course we have adopted in raising the money at this low rate of interest is for the future benefit of the Company. I have just been told by the Secretary that the Proprietor, who made such grievous complaints against the Board for their stinginess, has written to-day apologizing for having done so. It has been suggested this morning by another Proprietor that we ought to encourage a new Company to undertake the manufacture of our tar and sulphate, in place of doing it ourselves. The Board have considered this question most attentively, and have decided unanimously against such a step. We shall be able to derive a considerable amount of profit by working the concern ourselves, and we intend to put that profit into the pockets of the Proprietors. And now, gentlemen, I will wind up my remarks in a few sentences in reference to our works at Beckton. I wish some of the Proprietors would go down there and see the works for themselves. It is a most interesting place now. At the present moment we are manufacturing our own lime; we work up our old iron; and by-and-by the tar and sulphate works will be in operation—I hope before Midsummer next. I say it is well worth a visit from the Proprietors. I only wish our Official Auditor would sanction our taking you all down; but he is too vigilant a man for that—too cautious. Still, if I had my own way, I should like to see you all there. On former occasions I think many of you have visited those works when they were in their infancy. We have hundreds



of people there from abroad during the year. I have had the pleasure of receiving there a great number of scientific men, who have gone to inspect the works, and to gather a wrinkle from witnessing our operations. I believe the Beckton and Bromley works, from their situations, are the most prosperous in the world; I do not think anything can compete with Beckton, and I may say that the management of all our works has met with the sincere commendation of the Court of Directors. I beg now to move—"That this meeting do agree with and confirm the report of the Directors, and the Auditors report and statements of the accounts of the Company, as transmitted."

Mr. E. VAUGHAN RICHARDS, Q.C. (the Deputy-Governor), seconded the motion.

Mr. S. WARD said the Governor had spoken about improvements which had taken place in electricity, and he should have been glad to hear that great improvements were taking place in the manufacture of gas. He sometimes heard complaints of the quality of the gas supplied, and some of his friends told him they were leaving off the use of gas. He would, therefore, urge upon the Board that, having secured 10 per cent. to the Shareholders, they should endeavour in every possible way to produce the best gas they could for their consumers. In the notice of meeting he thought it should have been stated which of the Auditors went out of office on this occasion.

The SECRETARY said there need be no misapprehension on that point, as the notice stated that "the whole of the Auditors will retire, and will offer themselves for re-election."

Sir THOMAS DAKIN: Gentlemen, as an old Director here, and one who has taken a very active part in the gas administration of the Metropolis, and particularly of the City of London, I attend to-day with pleasure to see my old friends, and to hear the very able speech of the Chairman. Having done so, I beg leave to express my gratitude to the Board for the efforts they have made for the good of this concern, and for the prosperous condition in which they have placed us. I cannot sympathize in the smallest degree in the remarks just made by the Proprietor behind me, and can only rejoice to think, with regard to them, that, having no important point to challenge, either in the report or in the Chairman's speech, he has been obliged to fall back upon a trivial technicality to furnish himself with a topic on which to address the meeting. There is one remark I wish to offer in reference to some observations by the Chairman, and it is this: Some years ago, when I had the honour to occupy a similar position in another company, a scheme was brought forward for establishing the "Electric Light and Colour Company," and I thought it my duty at that time to go and see for myself the nature of the operations which they were carrying on. I took with me two of the ablest chemists of that day—Professor Graham, afterwards Master of the Mint, and Dr. Leeson—to investigate the matter, and advise whether there was anything in it. We went most carefully into every question, and when we came back from our inspection, I recollect Professor Graham saying that gas companies had no reason to fear the competition of the electric light until its promoters could accomplish two objects—viz., the storage of the light and its distribution. That has not yet been done, and, until it is accomplished, we have no reason to be anxious on that account. I have no doubt that for certain purposes, and in its own way, the electric light may prove to be exceedingly useful; for instance, in outside illumination of large spaces; but it is not at all adapted for the supply of such places as gas is applicable for, and I apprehend, therefore, that nothing which our Chairman saw in Paris, or we have seen in London, would give any serious foundation for the scare and alarm to which the investing public have been recently exposed. Before I sit down, I beg to express my regret that an analogous body to that to which I belong have behaved, as I think, rather harshly to this Company, when, as the Governor informs us, for a series of years the average quality of the gas supplied by this Company has been one candle above the parliamentary standard, and that only on this one particular occasion it fell below it. I think it would have been only just that the Metropolitan Board should regard that as the exception, proving the general rule that the supply of gas by the Company has been eminently successful, and not have seized upon the opportunity to exact a fine. That it was so regarded by the Magistrate who heard the case seems to be clear, for, though he found himself compelled by law to inflict the fine, he marked his sense of the harshness of the proceeding by refusing to give the Board their costs.

Mr. BURRAGE asked whether arrangements could be made by the Directors for the payment of dividends earlier, and whether, if they did not see their way to increase the rate of dividend, they could not arrange to pay the income-tax for the Proprietors.

Mr. SAYWELL objected to the large surplus carried forward, and, with reference to the reserve-fund, thought the Proprietors should be informed what the limit would be. As an old Shareholder in the Imperial Company, and having no interest in the 5 per cent. preference shares about to be converted into ordinary stock, he objected to any portion of the profits of the amalgamated Company being appropriated to pay the excess of dividend on this class of Chartered shares.

Mr. JACKSON asked for what purpose the £125,000 of debenture stock was to be issued.

Mr. BADDELEY: I have attended a great many public meetings, and heard a great many addresses from chairmen, but I am bound to say that I never listened to a more lucid speech in reference to the affairs of a company than that which has been made by the Governor on this occasion. As to Mr. Saywell's remarks, I can only say that I hold some of this 5 per cent. capital, and, as a holder of it, I am in the position of having lent my money at that rate of interest to the Company, to enable them to make a larger profit, and I am entitled, by the terms of issue of those shares, to the increased dividend when the time arrives. I am, therefore, only too pleased that the Directors have guaranteed it by setting aside a surplus on this occasion. The Proprietor who first addressed us recommended the Directors to supply a better quality of gas. I do not know why. We are under an Act of Parliament, and we are complying with every requirement of that Act. Surely there is no reason why we should give more than we are bound to give for the money we receive. As to the alleged discontinuance of the use of gas in drawing-rooms, to which my friend referred, I think if it is as he stated, it would be well for him to address his observations to the householders, and suggest that they should look to their interior arrangements, and not expect the Company to improve the quality of their gas because people will burn it through imperfect fittings. But my friend has omitted to allude to a very singular fact. Until the commencement of last year this Company were supplying gas at the rate of 3s. 9d. per 1000. A reduction of 3d. per 1000 was then made in the price, and that 3d., I believe, would represent, on the last six months consumption, a sum of about £60,000 taken off the rental. And it is remarkable that, notwithstanding this fact, our rental has increased to the extent of £212 over the corresponding period of the previous year. This does not look as if consumers were discontinuing the use of gas because it is not of a better quality; it rather shows the elasticity there is in the consumption. I may say, in conclusion, that I am glad to see every member of the Board present to-day, apparently in excellent health, and will express the hope that they may long live to preside over the affairs of this Company.

Mr. CRACE said the Governor, in referring to the electric light at Paris, did not make any allusion to its cost, nor did he say anything as to whether it had been tried under ground-glass shades, so as to qualify the intensity of the light, and diffuse it more.

The GOVERNOR: With regard to the question put by the last Proprietor, I may remark that the expense of the electric light is not yet ascertained. No one could tell me what the cost would be; but, certainly, from the appliances which are necessary in connection with it, the expense will be much greater than that of gas. In order to introduce it to dwelling-houses, a separate engine would be required for each house, and the cost of these engines would be considerable, although I believe that engines of comparatively small power would suffice. But if engines are to be introduced into houses, the question will be raised as to the future rates of fire insurance. The Insurance Companies might not be willing to continue the present rates for houses in which engines were in daily use. There is also a certain amount of danger from explosions; but I believe there is an invention coming out which may obviate that difficulty in some degree. With regard to a question put by an honourable Proprietor as to the way in which the £125,000 to be raised by debenture stock will be applied, the answer is that it will be applied to the general working of the Company. Instead of raising fresh share capital from the Proprietors, we raise the money we need by debenture stock, at a very much lower rate of interest—i.e., instead of raising it by 5 per cent. preference or 10 per cent. ordinary shares, we raise it at 4 per cent. and thus secure a greater profit for the general undertaking. As to the earlier payment of dividends, I think we can hardly do that. We do pay our dividends as soon as most companies. Before warrants for those dividends can be prepared, the dividends themselves have to be sanctioned and confirmed by the general meeting of Shareholders, and our Act of Parliament prescribes that the general meetings shall be held in the months of February and August. I have been asked about the income-tax. Well, if we paid that we should have to deduct it from the reserve-fund; we are not allowed to do otherwise. We may have a higher dividend by-and-by; but, as at present constituted by Act of Parliament, we are allowed to apply a certain amount of divisible profits to the augmentation of the reserve-fund. That fund now amounts to about £130,000, and to place the fund in a satisfactory position is the policy approved of by the general meeting of Proprietors held immediately after the amalgamations took place.

The motion for the adoption of the report was then put and carried.

A PROPRIETOR: There is one question which the Governor did not answer—viz., to what amount may the reserve-fund be raised?

The GOVERNOR: To any amount.

The SECRETARY brought up from the Court of Directors a minute recommending the dividends mentioned in the report, and on the motion of the GOVERNOR the said dividends were declared accordingly.

The retiring Directors, Messrs. Bennoch, Chubb, Evans, and Giffard, were re-elected, as were also the Auditors, Messrs. Barker, Chisholm, Briggs, and Farnan.

The GOVERNOR moved—"That the Directors be, and they are hereby authorized to raise, by the creation and issue of debenture stock, the further sum of £125,000 under the provisions of the Company's Act, 1872, at such periods, upon such terms, and under such conditions as the Directors shall determine."

The DEPUTY-GOVERNOR seconded the motion, which was agreed to.

The SECRETARY brought up a minute from the Court of Directors, under the provisions of section 58 of the Company's Act, 1868, declaring certain lands, &c., to be no longer required for the purposes of the Company, and asking the authority of the Proprietors for their sale. These properties were the lands, &c., belonging to the late Independent Gas Company at Kingsland, and the offices, &c., of the late Imperial Gas Company, John Street, Bedford Row.

The GOVERNOR moved a formal resolution for carrying out this object, which was agreed to.

Mr. PRICE: Before we separate, I beg to move a vote of thanks to the Governor and Board of Directors. The report which has been submitted to us, and the statements which the Governor has made as to the affairs of the Company, are most satisfactory, and show, I think, the great amount of attention which has been bestowed upon them by the Board.

Sir THOMAS DAKIN seconded the motion, which was cordially adopted.

The GOVERNOR: Gentlemen, on behalf of my colleagues and for myself, I beg to offer you my sincere thanks for the honour you have done us by the unanimous and cordial vote just passed. I can only assure you that in the future we shall devote our energies entirely to the interests of the Company, as we have done in the past.

The proceedings then terminated.

#### YORK UNITED GAS COMPANY.

The Half-Yearly Meeting was held on Thursday, Feb. 7—Alderman WEATHERLEY in the chair.

The SECRETARY (Mr. C. Sellers) read the Directors report, which was as follows:—

The balance of profit available for dividend falls short of the necessary amount by £955. This result your Directors, in a great measure, anticipated when they reduced the price of gas in July last from 3s. to 2s. 6d. per 1000 cubic feet, and intimated their intention to meet any deficiency which might arise by appropriating some of the accumulated surplus profits of previous years.

The business of the Company has been maintained in a healthy condition, although the consumption of gas, from the unusually mild weather and continued depression in trade, has been somewhat checked. The latter cause has also further reduced the value of residuals, which form a substantial item in the Company's revenue. Your Directors, however, are glad to be able to state that the public have now become fully alive to the great value of gas as a cheap domestic fuel.

During the half year your Directors, to meet the growing demands of the Nunery Lane and Bishopthorpe Road districts, have relaid the main from Blossom Street to Bishopthorpe Road with one of increased capacity.

The resolution passed by the Shareholders at the last half-yearly meeting, authorizing the Directors to take the necessary steps for increasing the capital of the Company to meet further extensions, is now being carried out by a Bill which your Directors are applying for in the present session of Parliament, and which will be submitted to this meeting.

The Directors recommend that Mr. W. W. Morrell, Manager of the York City and County Banking Company, be appointed Treasurer to this Company for three years, in place of Mr. Francis Taylor, who has resigned that office.

Your Directors recommend that the usual dividend of 5s. per share be declared, the same to be paid on and after the 12th inst., free from income-tax.

The CHAIRMAN, in moving the adoption of the report, remarked that the result of the last half year's business was a little below what the Directors anticipated, but that arose entirely from the continued flatness of trade, and the necessity which almost everywhere existed for economizing expenses. Those reasons had not only checked that increase in the consumption of gas which usually follows a reduction in price, but they had further depressed the value of certain residual products, which helped to make up their revenue. Of course all that was not new, and one almost got weary of talking about the general depression of trade, and its effects upon every branch of industry. Gas Companies, therefore, could not hope to escape; but in their case, having adopted the good old rule of putting by something for a rainy day, they hoped to pull through until better times arrived. The Shareholders would be aware that it was the policy of the Company in prosperous times to put by the surplus profits



over and above the dividend, so as to meet exceptional circumstances like those at present existing. It was that policy of giving back the surplus profits to the gas consumers which had enabled the Company to supply gas at rates below those in most other places, and which now enabled them to charge the extraordinarily low price of 2s. 6d. per 1000 feet, a price that was found in scarcely half-a-dozen towns in the kingdom. He need scarcely say that the recent fluctuations in the value of different articles they bought, and articles they sold, had been closely watched. In the matter of iron the price was exceptionally low, and the Directors had taken advantage of that, and had relaid the main down Nunnery Lane with one of larger dimensions, and in similar districts where the city had recently grown they would have similar work to do. With regard to coke—one of their great items of revenue—he was glad to say that the efforts the Directors made to bring that article under public notice as a cheap fuel had been very successful. With respect to the application they were making to Parliament for power to raise new capital and to extend their works, he said that the necessity for this step was fully explained at the last half-yearly meeting, and therefore upon that point there was nothing further for him to say now. It must be evident to all that they could not carry on increased business without increased plant, and he could assure them that every step they had taken in that matter had had the fullest possible consideration. The Directors had no other motive than to conduct the business of the Company so as to be not only satisfactory to the Shareholders, but to the whole city, for they felt sure that a policy which would separate the interests of the Shareholders from the common interests of the city would be as unwise as it would be suicidal. There was only one more matter that he would allude to, and that was the appointment of a Treasurer, which, by their Act of Parliament, required the confirmation of the Shareholders. Mr. Francis Taylor, of the Union Bank, their late Treasurer, having resigned, they proposed that Mr. W. W. Morrell, Manager of the City and County Bank, should succeed him, and be appointed for three years. They proposed that change of bank upon the same principle that they applied to all their business in the city, and that was to change periodically from one tradesman to another. It was a principle which had worked in the most satisfactory way, and one which they felt sure the Shareholders would deem fair and just.

The Lord Mayor seconded the motion for the adoption of the report, and said he had great gratification in doing so, believing, as he did, that the Directors had the full confidence not only of the Shareholders, but also, so far as he could judge, of the citizens at large. If any impartial man compared the charges made by this Company with those of any other Company for years past, he would be bound to come to the conclusion that this Company managed their business well.

Mr. W. W. HARGROVE congratulated the Directors on the successful result of another half year's working, and the city on the fact that there was no intention to increase the price of gas. This was due to the sagacity and forethought of the Directors in husbanding the surplus profits of more prosperous days to meet contingencies like the present, when the general depression of trade, affecting detrimentally every species of industry, had necessarily reduced the consumption of gas. The Chairman, in his remarks, had mentioned that there were not a half a dozen places where the gas was so low as in York. He (Mr. Hargrove) had carefully gone through the list of prices, and he found that there were only two towns—viz., Walsall and Plymouth, where the price was less than in York; and there were circumstances which fully accounted for it. At Walsall, where it was 2s. 5d., they had coal at their very door, and at Plymouth, where it was 2s. 4d., they obtained it from South Wales at an extraordinarily low rate. To the Bill, for which the Directors were applying to Parliament, it would be impolitic to refer in the present stage of negotiations between the Company and the Corporation, further than to state that he thought they might safely rely upon the good sense of those who had promoted the petition against the Bill, to avoid any factious opposition, and upon the just protection which Parliament always afforded to a Company who, like the one in question, were seeking powers of extension, not for their own aggrandisement, but for the advantage of the city. He was sure the Directors had the full confidence of the shareholders, and he believed of the inhabitants generally. Extending as York was in every direction, it was obvious that the Gas Company must be prepared to meet increased demands. He believed the public were perfectly satisfied with the present price of gas in York, that they felt they had been fairly dealt with in the past, and that they had could rely upon receiving the same generous treatment in the future.

The CHAIRMAN, in reply to inquiries by Mr. Feltoe, said the Directors had no intention to extend the mains to any village that would not return a proper dividend. The city was extending, and tradesmen were erecting villas outside, and it was necessary for the protection of life and property that there should be sufficient light near the houses. He was surprised at any one asking why they were going to enlarge their works. The reason was simply because they required additional storage for gas, and additional carbonizing power. They did not want to borrow money if they had nothing to do with it, but they were going to increase their capital in order to provide for an enlargement of their works, of which they stood in need now. They were not going to increase their carbonizing powers at present, but only to enlarge their storage. It would take three years to erect a gasholder, and by that time they would have to augment their carbonizing power. They were well aware that it was not necessary for the whole of the capital to be called up at once. Thirty years ago they commenced, with a capital of £75,000 and borrowing powers amounting to £25,000. The borrowed money had since then been capitalized, and the whole was now expended. But what had they done in the meantime. The works had been extended, and there was not now an inch of spare ground. He hoped the Shareholders would have confidence in the Directors to believe that they had no other intention than to do what was necessary for the proper carrying on of their business. In answer to further inquiries, he said the reason why the Directors inserted a clause in their Bill for extending the radius of the Company's operations was that they knew it was the intention of the Government to erect extensive military works at Strensall, and they thought it possible that the Company might be required to supply the gas. They were not going there for any other purpose, and if their gas was not required they would not extend their mains there. If they supplied the gas, it would tend to increase their profits.

Mr. FELTOE said they were proposing to raise £100,000 for the purpose of forming a new company, and a company which could not in any degree be associated with the present Company, but which would have the benefit of their mains and works. They could not increase the present financial position of the Shareholders one iota, and the money which they proposed to raise would not benefit them in any degree. If it was necessary for properly conducting their business to increase the storage room, they did not require to cross the water for the purpose, as with a little management they could find sufficient room on their present premises.

Mr. RYMER, referring to the proposed change of bankers, said he could understand that it might be desirable that they should change their tradesmen and thus distribute favours, but he did not think that the same reason applied to their bankers.

The CHAIRMAN said the intention had not arisen from any fault they had

to find with their present bankers, but because the Board thought it desirable to make a change every three years.

The motion for the adoption of the report was put and carried, and a resolution declaring the dividend recommended by the Directors was agreed to, as was also a further resolution appointing Mr. W. W. Morrell Treasurer of the Company.

The meeting was then made special, and a motion approving of the Company's Bill now before Parliament was adopted.

A vote of thanks to the Directors, which was acknowledged by the Chairman, terminated the proceedings.

## IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The week has been fraught with so much political excitement that all sorts of business operations have been confined within very narrow limits. Producers have for the most part manifested an unwillingness to enter into forward contracts, in the belief that an outbreak of war might render certain classes of iron more valuable, whilst consumers have held aloof under the impression that the commencement of hostilities would inevitably be succeeded by a considerable depression of values of all descriptions. Probably both views are to a certain extent based on sound reasoning, but, be that as it may, it is not the less certain that the immediate result has been to further minimize the business of most branches of the coal and iron trades of this, as well as of other, districts. It seems, in fact, to be now more than ever certain that we cannot look for any real improvement in the iron trade until it is clearly seen in what manner the Eastern Question is to be disposed of. On the other hand, two or three branches of trade at Sheffield are already being benefited by the warlike preparations of this country—good orders having been received here for heavy ordnance steel tubes, as well as for rifle barrels.

During the week there has been no material alteration in local and district pig iron quotations, despite the somewhat firmer tone of the Scotch market. In merchant iron, also, prices remain on the previous very low basis, and none of the works are running more than half time. At the Midland Iron-Works, near Rotherham, the ironworkers have agreed to a reduction of  $\frac{7}{8}$  per cent., and at other large establishments a like step is being initiated.

The brassfoundries are not by any means busy, but some of them are doing a steady amount of business in gas, water, steam, and general plumbers fittings.

The coal market is not quite so firm, and during the week some of the coalowners and merchants have lowered their prices to the extent of 6d. per ton. At many of the pits the miners wages are being lowered, although at some few places the men are offering resistance. Steam coal is quiet at 5s. 6d. up to 9s. per ton at the pits.

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is but a very limited demand for all descriptions of fuel in this district, and for common sorts if anything prices, are a trifle easier. For some, of the better classes of round coal there has been a tolerably good inquiry, but there has not been anything like the usual winter trade doing in this class of fuel, and the season when any active demand can be expected is now rapidly drawing to a close, whilst the requirements for gas-making purposes are also beginning to fall off considerably. For round coal the quotations at the pit mouth remain at about 10s. to 11s. per ton for best Wigan Arley, 8s. to 9s. for common Arley, 8s. to 8s. 6d. for Pemberton four-feet, and 6s. to 7s. for common Wigan mines. The demand for forge coal and engine classes of fuel is very dull, and there is a good deal of pushing for orders. Prices are irregular, but the average quotations at the pit mouth may be given at 5s. 6d. to 6s. 6d. per ton for steam and forge coal, 5s. to 5s. 6d. for good burgy, 4s. 6d. to 5s. for common ditto, and 3s. to 4s. for good slack; whilst common is offered almost at any price up to 3s. per ton.

The shipping trade continues extremely quiet, there being very few orders for any description of fuel offering in the market, and exceedingly low prices are quoted to secure business.

In the iron trade business is in a very unsatisfactory condition, and there is little or nothing moving beyond a few small orders for pressing requirement, which consumers are obliged to cover. Lancashire makers of pig iron are still doing very little, as they are unable to compete with the low figures at which outside brands are being offered in the district, and when the few contracts they have on hand are run out, it is not improbable that the present very limited production will have to be still further reduced. The finished iron trade is in no better position. None of the works in this district are busy, and in the majority of cases either only a portion of the plant is running, or the men have been put on short time. Prices are without change, and makers, so far, have been unable to agree to any uniform basis for quotations.

The finished iron makers have, however, been able to agree to another reduction in wages, and notices are being sent out to the men to the effect that their wages will have to be reduced 5 per cent.

The works of the Railway Steel and Plant Company, near Manchester, have been stopped, and about 400 men thrown out of employment.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

A good deal of change has taken place in the coal trade since our last report. The strike in the Northumberland steam coal trade is over, and the pits have resumed work. Odessa is now absolutely open to steamers. In consequence of these two circumstances coming together, shipments of coal have been much more active than a fortnight ago. In fact, there has been a considerable increase of exports at the Tyne Dock, mostly gas; and a considerable fleet of vessels are loading steam coal in the Northumberland Dock on the opposite side of the water. A fair amount of contracting was done last week by foreign Gas Companies, for the South of Europe and for Italy principally. One contract was for 60,000 tons of gas coals, to extend over the year, and others were for less quantities; 25,000 tons of gas coals were contracted for for Sweden. Several cargoes of gas coals were sent out to America last week by steamers. Some business was also transacted with France. The price, however, is unchanged. From 7s. to 8s. is about the quotation for best gas for immediate delivery. Shipping turns are from eight to ten colliery working days. Some sorts of second-class coal have been more in request. House coals, however, are very quiet. The mild weather is keeping back the demand for the better qualities of house coals.

The Baltic shipments of gas and steam coals are likely to commence shortly. Several contracts are reported to be closed for the season with Sweden, Germany, &c. The quantity of coke shipped during 1877 from the Tyne to Spain, for lead-smelting purposes, is about 105,000 tons, being an excess over the previous year.

The importation of Spanish lead during 1877 was about 31,000 tons, which was also an excess on the previous year.



The quotations for steamers to load coals to London are from 4s. 3d. to 4s. 6d., and there have been inquiries for steamers and sailing vessels to load coals to France. Several cargoes of gas coals have been shipped for Odessa; the rate is £12 per keel. There has not been much demand for small coasting vessels to load coals for the east coast, but small ships have been sought after for the Kentish and Channel ports, and there has been a good demand for small ships to load coals for the French by-ports. The outward freights for gas coals to America are unchanged. The American Gas Companies are procuring coals here at a marvellously low figure; 8s. is about the price for the very best sorts shipped, and the freights are from 5s. to 6s. 6d. per ton.

The iron trade is neither better nor worse; it goes on very quietly from week to week. With the rumours of war, and all the excitement that has prevailed for a fortnight, home business is about paralyzed. People have no idea what they should do, and Railway Companies and other carriers are feeling the uncertainty which surrounds business very much. Some fire-bricks and fire-clay goods were shipped last week, but the demand is not equal to an ordinary year, and all the business that has been done in shipments is, as a rule, in small quantities.

The labour market is not quite so much overstocked as it was a few weeks ago. Some hundreds of seamen have been got to sea, and a number of firemen, and such like persons employed on board steamers, have found employment.

**ISLE OF THANET GAS COMPANY.**—Mr. T. C. Fuller, who has for ten years represented this Company as Accountant and Secretary at both Ramsgate and Margate stations, and whose services were not retained by the Ramsgate Local Board at the recent transfer of the Ramsgate undertaking, is, we hear, still representing the Gas Company at their Margate station.

**GAS ANALYSIS.**—The report of the Council of the Institute of Chemistry of Great Britain and Ireland, read at the first general meeting of the present session on the 1st inst., stated that Dr. Frankland, the President, has offered two prizes of £50 each, to be awarded by the Council of the Institute at the next general annual meeting, for the two best original investigations involving gas analysis, and conducted by Associates of the Institute.

**ROAD WATER SUPPLY ON THE METER SYSTEM.**—At the Meeting of the Wandsworth District Board on the 13th inst., Mr. Barber, the Surveyor for Streatham, presented the following report, which was referred to a Committee for consideration:—"In asking you to consider the arrangements for road-watering in the ensuing season, I beg to report that last year you watered 37 roads in the Parish of Streatham, the aggregate

length being 13 miles 3 furlongs 168 yards. The whole of the water was purchased by meter of the Lambeth Water Company at 9d. per 1000 gallons low-level service, and 1s. per 1000 gallons high-level service. The total cost of water, including the hire of meters and stand-posts, amounted to £259 13s. 5d., or equal to £19 5s. 6d. per mile of road watered. The total expenditure for road-watering purposes last year was £870 8s. 2d. I would also desire to refer now, after 21 years experience in watering your roads, to the great saving effected by the meter system of purchasing the water, which last year alone was upwards of £450, and which fully justifies the calculations contained in the report which I made to the Board, when urging the adoption of this system in the year 1860. During the first eight years you paid for water and the hire of stand-posts £67 10s. per season of six months per mile of roads watered, irrespective of their width. During the next six years the charges for water and stand-posts were reduced to £53 10s. per mile per season. In the year 1870 I reported on the subject again, and in 1871 arrangements were made for having the water by meter, and these arrangements still continue. During the seven years just ended, the average cost of the water, including rent of meters and stand-posts, amounted to £22 13s. 3d. per mile of road watered per season of seven months, which is £30 16s. 9d. per mile per season less than the lowest charge paid under the mileage system."

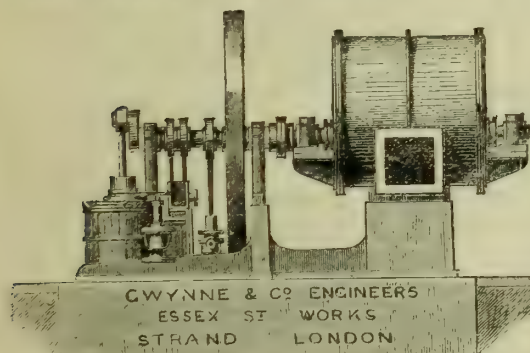
**ADOPTION OF THE SALES OF GAS ACTS AT LEITH.**—Public advertisements have appeared, announcing that the Magistrates of the Burgh of Leith having considered the provisions of the Sales of Gas Acts, 1859 and 1860, and the Act of 1864, which enables certain Royal and Parliamentary Burghs in Scotland to avail themselves of the provisions of the first-named Acts, did, at a meeting held for the purpose on the 28th of December, 1877, resolve that the provisions of the said recited Acts shall be applicable to the whole District or Burgh subject to their jurisdiction on and after the 1st of April next. By these Acts it is provided that after the expiration of ten years from the date when the Acts shall come into operation within the Burgh of Leith, all meters whatsoever not previously stamped, which shall be used for buying and selling gas, or for the collecting of any rates or duties, or for making any charges on the passage, transmission, or conveyance of gas, shall be examined and tested under the authority of said Acts, and stamped if found correct; and it is also enacted that no meter, for the purpose of ascertaining the quantity of gas sold, shall be fixed for use after the expiration of twelve months after said date, when the Acts shall come into operation, unless the same shall have its measuring capacity denominated or marked on the outside thereof in legible letters or figures, and shall be stamped by the Inspector of Meters. And penalties are provided for non-compliance.

The **GRAND MEDAL of MERIT** at the **VIENNA EXHIBITION**, and **TWO MEDALS** at the **PHILADELPHIA EXHIBITION** have been **AWARDED** to **GWYNNE & CO.** for **GAS-EXHAUSTERS, ENGINES, and PUMPS**;  
Also **27 OTHER MEDALS AWARDED** at all the **GREAT INTERNATIONAL EXHIBITIONS.**

## GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.,** Hydraulic and Gas Engineers, **ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.**

*Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.*

## BEALE'S IMPROVED PATENT GAS EXHAUSTERS

WITH

## ENGINES COMBINED.

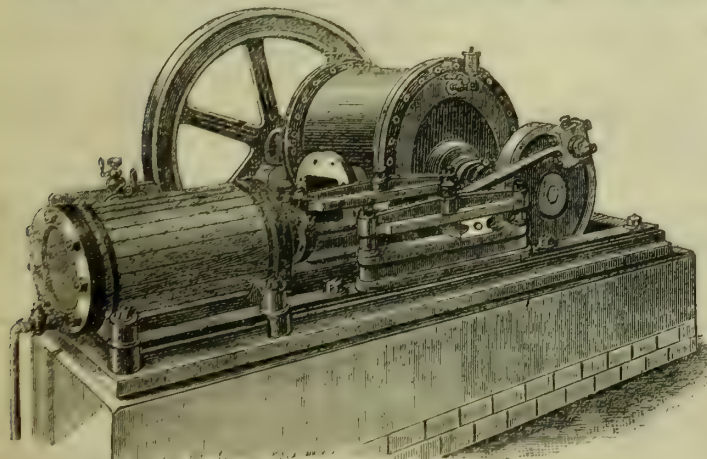
SOLE MAKERS,

**GEORGE WALLER & CO.**

MAKERS OF ENGINES, EXHAUSTERS,  
INDEX AND DISC GAS-VALVES,  
HYDRAULIC MAIN VALVES,  
BYE-PASS VALVES,  
TAR, LIQUOR, AND OTHER PUMPS,  
SCRUBBERS AND PURIFIERS,  
CONDENSERS, BOILERS, &c.

Awarded Silver Medal at the Manchester Exhibition of the Society for the Promotion of Scientific Industry.

**Phoenix Engineering Works:**  
**HOLLAND STREET, S.E.**





**WANTED, Readers of the Pamphlet,**  
"Cooking and Heating by Gas; on Burners," &c.  
Copies, by post, Threepence, direct from the Author,  
MAGNUS OHREN, Gas-Works, SYDENHAM, S.E.

**WANTED, Two Second-hand Purifiers,**  
10 to 12 ft. square, with Connections. In good  
order.  
State price and particulars to W. SMITH, Gas-Works,  
Newton, Ayr.

**DEVONPORT WATER-WORKS.**  
**WANTED, several experienced Men as**  
INSPECTORS of Water-Works Fittings.  
Apply, stating age, experience, &c., to H. FRANCIS,  
Manager, Water-Works Offices, DEVONPORT.

**WANTED, by a practical Man, a**  
situation as FOREMAN or WORKING MANA-  
GER of Gas-Works. Good experience in erecting and  
management in all branches. Can be well recommended.  
Address A. B., 8, Water Street, Pembroke Dock, SOUTH  
WALES.

**WANTED, Orders for Samples to test**  
the superior Silikstone, Wigan, and other Gas Coals  
and Cannel on Sale by G. J. EVESON, Gas Coal and Cannel  
Contractor, BIRMINGHAM.  
N.B.—Prices on personal application, or by post or tele-  
gram, on shortest notice, and prompt delivery.

**WANTED, by the Advertiser, Assoc.**  
Inst. C.E., and thoroughly qualified as a Gas  
Manager, an APPOINTMENT at home or abroad. Speaks  
French, Spanish, Italian, and Portuguese, and has excel-  
lent testimonials.  
Address No. 437, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

**WANTED, by a Gas Company on the**  
South Coast, Two good, sober Men as STOKERS.  
Must be used to charging with the shovel. Constant em-  
ployment at good wages.  
Apply, by letter only, with testimonials or reference, to  
No. 438, care of Mr. King, 11, Bolt Court, Fleet Street,  
LONDON, E.C.

**TO GAS-METER MAKERS.**  
**WANTED, by the Cork Gas Consumers**  
Company, a thoroughly competent Man to take  
charge of repairs of Gas-Meters, and, if required, to in-  
struct Young Hands in the Shop. Number of Meters  
between 4000 and 5000.  
Applications, stating wages required, and accompanied  
by copies of testimonials, to be addressed to DENNY LANE,  
Secretary, 72, South Mall, CORK.

**WANTED, by Samuel Thompson & Co.,**  
Colliery Office, Lancaster, APPLICATION for  
PRICES from Gas Managers who are prepared to receive  
Tenders for GAS COAL or CANNEL.  
John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his  
analytical report of S. T. & Co.'s Coal, says: "It is  
remarkable for its purity, I have scarcely ever examined a  
Coal containing so small a quantity of ash, and when Cannel  
of the best description is scarce, it may well replace this  
material."

**WORKING Gas-fitter and Plumbers**  
BRASSFOUNDER Wanted, to manage a small  
Business at Smethwick, near Birmingham. £200 security  
required.  
Address, Messrs. W. BLEWS AND SON, BIRMINGHAM.

**ON SALE—One Station-Meter, to pass**  
1000 cubic feet per hour. Almost new. Will be sold  
cheap.  
Apply to J. HALL, Gas-Works, St. Helen's, LANCs.

**FOR SALE—A First-Class Station-**  
METER, to pass 20,000 cubic feet per hour. May  
be seen at work. It is to be disposed of to make room  
for one of greater capacity.  
Apply to E. GODDARD, Gas-Works, Ipswich.

**FOR SALE—Two Purifiers, 6 ft. by 4 ft.**  
each, with Valves, and a quantity of 4-in. Piping,  
Bends, &c.  
For price, apply to C. R. ADAMS, Auctioneer and Manager  
of Gas-Works, KENILWORTH.

**FOR SALE—Four Purifiers, 9 ft. by 6 ft.,**  
with Centre-Valve, 6-in. Connections. Also Four  
Tiers of Wood Sieves, all in good working order, the re-  
moval of which is required for extensions.  
Apply to Mr. EDWARD LISTER, Gas-Works, Yeadon, near  
LEEDS.

**FOR SALE—One 4-inch Valve of**  
B. Donkin's.  
Four 7-in. VALVES of B. Donkin's.  
One 8-in. VALVE of B. Donkin's.  
Two 7-in. VALVES of another manufacturer.  
All in good condition. Will be sold cheap.  
Apply to Gothenburg Gas-Works, SWEDEN.

**GAS PLANT FOR SALE.**  
**TWO Purifiers, each 8 ft. square, with**  
8-in. Valves for working same. Also One Wrought-  
iron TRAVELLER, for lifting 12-ft. square Purifier Covers,  
with propelling motion attached. In good condition.  
Applications to be made to the undersigned,  
CHARLES READ, Secretary and Manager.

**FOR SALE—A Telescopic Gasholder,**  
25 ft. by 10 ft. 6 in., in Brick Tank. Inner Lift new  
two years since, with new Guide Columns, Wheels and  
Carriages, Chains and Balance-Weights.  
Must be removed for the enlargement of Works. To be  
sold a bargain.  
For particulars, and order to view, apply to RICHARD  
HOLMES, Esq., Secretary, Gas Company, Arundel, SUSSEX.

**FOR SALE—Two 50-ft. Gasholders and**  
Columns, &c.  
One 52-ft. Wrought-iron TANK (above ground).  
One STATION-METER, to pass 15,000 cubic feet per  
hour.  
Twenty 15-in. Circular MOUTHPIECES.  
Seventy feet of 14-in. HYDRAULIC MAIN, D-shaped.  
The whole of the above are in good condition.  
Apply to J. S. REEVES, Manager, Gas-Works, BILSTON.

**TO BE SOLD, very cheap, as they stand,**  
for immediate removal, Four Cast-iron PURIFIERS,  
10 ft. by 5 ft., with strong Wrought-iron Covers, Wood  
Sieves, and Lifting Apparatus complete, and 8-in. Hy-  
draulic Centre-Valve and Connections.  
Also a STATION-METER, in Cast-iron Case, with Clock  
and Tell-tale, and Bye-pass Valves, all complete. To pass  
6000 cubic feet of gas per hour.  
The above apparatus has just been thrown out of use at  
the Uxbridge Gas-Works, where it may be seen.  
Apply, for price, &c., to Mr. ALFRED PENNY, 20, Abingdon  
Street, WESTMINSTER, S.W.

**THE Directors of the Hebden Bridge**  
Gas Company have for SALE the following PLANT:  
Four Purifiers, 8 ft. by 6 ft. by 3 ft., with Lifting Appa-  
ratus.  
Hydraulic Centre-Valve, with 10-in. Connections.  
One 5-in. Vertical Condenser, consisting of 16 Pipes,  
with Bridge Pipes.  
One 7-in. Vertical Condenser, consisting of 7 Pipes,  
with Bridge Pipes.  
One Cast-iron Scrubber, 12 ft. by 3 ft. 4 in. by 4 ft. 4 in.  
One Station-Meter, with 7-in. Connections, Valves,  
and Bye-pass complete.  
Particulars may be had from the undersigned,  
JOHN U. BLACKBURN, Manager.  
Gas-Works, Hebden Bridge, Feb. 6, 1878.

**TO MANUFACTURERS OF FIRE-CLAY RETORTS**  
AND OTHERS.  
**THE Directors of the Longton Gas Com-**  
pany invite TENDERS for the supply of 840 ft. run  
of RETORTS. Also Bricks and Clay.  
A specification and form of tender may be had by  
applying to the Company's Manager, Mr. J. M. DARWIN,  
Gas-Works, Longton, STAFFORDSHIRE.  
The tenders must be sent so as to be received on Monday,  
the 4th day of March next, and the Directors will not be  
bound to accept the lowest or any tender.

**CONTRACT FOR GASHOLDER.**  
**THE Police Commissioners of Inverness**  
desire TENDERS for the construction of a Cast-  
iron TANK, of 71 ft. 6 in. diameter, and Telescopic GAS-  
HOLDER, in Two Lifts, each of 20 ft. depth, in terms of  
plan and specification, copies of which can be had on ap-  
plication to Mr. J. THOMSON, Manager of the Gas-Works,  
INVERNESS, on payment of One Guinea; and sealed tenders  
to be lodged with ALEXANDER DALLAS, Esq., Solicitor,  
Clerk to the Commissioners, on or before the 4th of March  
next.

**PORTRUSH GAS COMPANY, LIMITED,**  
CO. ANTRIM, IRELAND.  
**THE Directors of above Company invite**  
TENDERS for One GASHOLDER and Cast-iron  
TANK. Also Hydraulic Main.  
Specifications will be furnished by Mr. JOHN BAMFORD,  
Secretary, PORTRUSH.  
Sealed tenders to be forwarded on or before the 25th of  
March next, addressed to the Chairman of the Portrush  
Gas Company.  
The Directors do not bind themselves to accept the  
lowest or any tender.  
Portrush, Feb. 8, 1878.

**LYTHAM IMPROVEMENT COMMISSIONERS.**  
**THE Gas-Works Committee are prepared**  
to receive Designs and Tenders for supplying and  
erecting, at their Works, Lytham, Four 10-ft. square  
PURIFIERS, together with 10-in. Valve, and necessary  
Connections.  
Sealed tenders, accompanied by designs, must be sent in  
to John Richardson, Esq., Chairman of the Gas Committee,  
on or before Tuesday, the 26th day of February, 1878.  
Any further information may be obtained at my Office,  
Market Hall, Lytham.  
By order of the Commissioners,  
THOMAS BOWER, Manager.  
Gas-Works, Lytham, Feb. 8, 1878.

**BOROUGH OF BURY.**  
**THE Gas Committee of the Corporation**  
are prepared to receive Drawings, Specifications, and  
Tenders, for a CONDENSER of the Vertical Annular  
type, with 20-in. diameter, Connections, Pipes, Valves, &c.,  
fixed complete. Minimum capacity, 70,000 cubic feet per  
hour.  
Particulars may be obtained from J. Cartwright, C.E.,  
the Borough Surveyor.  
Tenders to be sent in, addressed to the Chairman of the  
Committee, on or before the 12th day of March.  
By order,  
F. BULL, Town Clerk.  
Corporation Offices, Bury, Feb. 6, 1878.

**THE LONDON GASLIGHT COMPANY.**  
NOTICE is hereby given that the above Company  
will from Midsummer, 1878, next supply Ordinary Gas  
only; and that the supply of Cannel Gas will be discon-  
tinued from that date.  
Dated this 13th day of February, 1878.  
By order of the Board,  
A. J. DOVE, Secretary.

**THE Directors of the Wareham Coal Gas**  
Company are prepared to receive TENDERS for the  
supply of from 280 to 320 Tons of Pelaw Main Gas Coals (best  
quality), to be delivered, free of charge, into lighters, at  
Russell Quay. The first delivery to be made not later than  
the 30th of June next, the remainder to be delivered by the  
1st of September next.  
Payment for the same will be made four months after  
delivery.  
Tenders to be sent in to the undersigned on or before the  
13th of March next.  
By order,  
F. FILLITER, Secretary.  
Wareham, Dorset, Feb. 13, 1878.

**THE Exeter Gaslight and Coke Company**  
are prepared to receive TENDERS for the erection  
of a Telescopic GASHOLDER, about 115 ft. diameter, in  
Two Lifts, each about 25 ft. deep. Also for an Iron TANK,  
with all necessary excavations to receive same.  
Plans and specifications may be seen on application to  
the Engineer, at the Basin Gas-Works, between the hours  
of Nine and One o'clock.  
Separate and sealed tenders, marked "Tender for Gas-  
holder," and "Tender for Tank," to be sent to me, the  
undersigned, on or before Saturday, Feb. 23.  
The Directors do not bind themselves to accept the  
lowest or any tender.  
By order,  
W. A. PADFIELD, Secretary.  
Gaslight Offices, Exe Island, Exeter,  
Feb. 7, 1878.

**MANCHESTER CORPORATION GAS-WORKS.**  
**TO COLLIERY PROPRIETORS & OTHERS.**  
**THE Gas Committee will receive, on the**  
25th day of March next, TENDERS of CANNEL  
and COAL, for delivery at their Works, situated at Gay-  
thorn and Rochdale Road, over a period of One or more  
years, from the 30th day of June next (tenders for Three or  
Five years will have the preference), and the Committee  
are now prepared to receive applications for permission to  
send in samples.  
Sealed tenders, stating price and quantity proposed to be  
delivered at each Station, the rate and period of delivery,  
and endorsed "Tender for Cannel" or "Coal," as the case  
may be, must be addressed to the Chairman of the Gas  
Committee, and delivered at this Office on or before Mon-  
day, the 25th day of March next.  
The Committee do not bind themselves to accept the  
lowest or any tender.  
By order,  
JOSEPH HERON, Town Clerk.  
Department, Town Hall, Jan. 30, 1878.

**TO TAR DISTILLERS, MANUFACTURERS, AND**  
OTHERS.  
**THE Directors of the Phoenix Gaslight**  
and Coke Company are prepared to receive TENDERS  
for the purchase of the TAR made at their respective  
stations, at Vauxhall, Bankside, and Greenwich, for the  
period of One, Two, or Three years, from the 1st day  
of April ensuing.  
The quantities will be approximately—Vauxhall,  
1,200,000 gallons; Bankside, 290,000 gallons; and Green-  
wich, 400,000 gallons, in twelve months; total, 1,890,000  
gallons.  
Tenders may be made for one, two, or more of the  
stations.  
Forms of tender and conditions of contract may be had  
upon application to the Secretary, 70, Bankside.  
Tenders, endorsed "Tender for Tar," to be delivered at  
this Office on or before Wednesday, the 6th of March, at  
One o'clock p.m.  
The Board do not bind themselves to accept the highest  
or any tender.  
By order of the Court of Directors,  
I. A. CROOKENDEN, Secretary.  
70, Bankside, S.E., Feb. 18, 1878.

Lately published, 1091 pages, with Illustrations, 8vo.,  
£1 11s. 6d.,  
**EXPERIMENTAL RESEARCHES IN**  
PURE, APPLIED, and PHYSICAL CHEMISTRY.  
By E. FRANKLAND, Ph.D. (Marburg), D.C.L., F.R.S., Pro-  
fessor of Chemistry in the Royal School of Mines, &c. The  
work includes investigations on the Manufacture and  
Illuminating Power of Gas, on the Water Supply of Towns,  
and the Purification of Drainage from Towns and Manu-  
factories.  
"The memoirs now collected form a good example of the  
benefits which always accrue when science is adequately  
applied to technical subjects."—*Philosophical Magazine*,  
Feb., 1878.  
J. VAN VOORST, 1, PATERNOSTER ROW.

**TO GAS ENGINEERS, MANAGERS, &c.**  
**HILL and CO., Gas Engineers and**  
Architects, 11, Appach Road, BRISTON RISE, S.W.,  
prepare Designs for the construction of New Gas-Works,  
Bridges, and Roofs, or for the remodelling and extension  
of existing Works. Also provide Drawings of all kinds of  
Gas Apparatus and Plant. Drawings, Tracings, and  
Specifications copied for Engineers and Contractors.

## TO GAS ENGINEERS.

D. BRUCE PEEBLES & CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with  
PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting  
on the Bell by Pneumatic Pressure instead of Weights.

TAY WORKS, BONNINGTON, EDINBURGH.



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## TO CORRESPONDENTS.

**A COUNTRY MANAGER.**—Under the 13th section of the Gas-Works Clauses Act, 1871, Companies may furnish their consumers with either wet or dry meters, at their option, provided they are "legal meters" within the meaning of the Sales of Gas Act. On the other hand, if a consumer provides his own meter, the Company cannot refuse to approve of it, whether wet or dry, if, when duly tested, it is found correct according to the provisions of the last-named Act.

## THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, &amp; SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 26, 1878.

## Circular to Gas Companies.

On Thursday last, the Lord Chancellor introduced to the House of Lords a Bill to consolidate, with amendments, in one Act, the provisions of the Gas-Works Clauses Acts, 1847 and 1871, which was read a first time, and ordered to be printed. We have not yet obtained a copy, and cannot speak confidently as to what the amendments may mean, but there can be little doubt that among the so-called amendments will be found provisions intended to facilitate the transfer of gas undertakings from Companies to Local Authorities. What shape these will take we can only guess. It might be imagined, from the speech delivered by

Mr. Leeman in the York Town Council, to which further allusion will presently be made, that the Act will fix the terms of purchase, or rather the principle on which such terms shall be arranged. We shall, no doubt, have the Bill before our next issue, so need not speculate further now.

The Board of Trade have issued a "Memorandum as to the 'Object and Effect of the Weights and Measures Bill,' from which we learn that the Sales of Gas Acts are not to be included in the consolidating measure. The Memorandum states that—

The Acts relating to the sale of gas contain certain provisions respecting standards which are to be provided by the Board of Trade, and respecting local inspection and local standards similar to the provisions of the Bill relating to other weights and measures; but as the former provisions differ considerably from the latter, and are mixed up with the law relating to gas-meters, and the manner in which gas is to be sold, these Acts have not been included in the Bill.

We had an idea that the Bill would include some provision for the better examination of meters, but it seems this will have to be effected by a special enactment emanating from the Board of Trade.

The York Town Council have decided on calling a meeting, under the Borough Funds Act, to obtain, if possible, the consent of the Ratepayers to the expenditure of public money in opposing the Bill of the York United Gas Company. Whatever may be the result of the show of hands, a poll will, of course, be demanded, after which a scrutiny may follow. The Gas Company are, we believe, popular in York, and the opposition which is being raised is excited by agitators, whose desire is to confiscate the undertaking. They are led by Mr. Leeman, M.P., still, as of yore, the determined enemy of the Company. We believe that this agitation will fail in its object, as did the last, promoted with a similar view. Some people in York seem scared by the large amount of new capital asked for in the Bill of the Company. Others, selfishly inclined, object to the extended limits of supply proposed. They imagine that if Strensall, eight miles distant, be furnished with gas, it will prevent any reduction of price in York City. It is hardly likely, however, that the Company will run their mains so far for several years to come. The environs of York are rapidly increasing in population, and the more densely inhabited rural districts ought certainly to have a supply of gas, that is, if the estimated consumption promises to yield a profit on the outlay made to furnish that supply. We feel certain that the Directors of the York Company would never drive mains miles into the country merely to spend capital. Mr. Leeman alluded at some length to the compulsory purchase of the Stockton and Middlesbrough Water Company. He is evidently in love with compulsory purchases; but he denies the right of the confiscated to compensation for prospective profits. On this point we think he will find the majority of the Legislature decidedly against him. The goodwill of a concern, which includes prospective profits, is an essential element in the calculation for deciding the value of any business. We shall wait with some curiosity for the result of the poll, which is sure to be taken under the Borough Funds Act.

The half-yearly meeting of the Liverpool United Gas Company was held on the 20th inst., when maximum dividends on all classes of shares and stock were declared. The agreeable announcement was also made, that the Directors now feel themselves in a position to reduce the price of gas to 3s. 6d. per thousand cubic feet, as from the 1st of January. The necessity of providing for the payment of the claim on account of the fire at the landing-stage has prevented the reduction from being made earlier. We hope that much of the grumbling that has been heard in Liverpool, and all agitation against the Company, will now cease.

The Wigan Corporation took over the undertaking of the Gas Company in 1874. When they did so, they must have been aware they had incurred certain responsibilities as to the preparation and publication of the accounts of the undertaking. It would seem, however, the requirements of the General Acts of 1847 and 1871 have never been complied with. What we may call snatches of accounts, have been published in the general accounts of the Corporation; but that abstract which is to be printed, and which is to be deposited with the Clerk of the Peace, and sold for a shilling a copy, has never been prepared. This fact has been brought to light in a pamphlet written by a gentleman, who has taken the trouble to go through all the accounts he can find, in order to ascertain the real position of the undertaking. In one account, the Gas Committee claim to have made a profit of £10,000 in one half year. Mr. Templeton, the author of the pamphlet to which we refer, writes, however, to show that no profits at all have been made since the works came into the hands of the Corporation, but, on the contrary, there has been a loss of £20,000. Supposing all Mr. Templeton's allegations can be supported, the Wigan undertaking appears to have been managed in an extraordinary way. The



receipts for gas have, in the course of the three years, increased ten per cent., while the cost of labour for producing the gas has increased fifty per cent. Many things are charged to capital, which ought to have been paid for out of revenue; for instance, renewal of retorts, and even wages.

Mr. Templeton is not the only accuser that the Gas Committee of Wigan have to reply to. There is the Local Board of Standish, whose district lies within the Wigan gas limits. These, too, complain that no abstract of accounts has been prepared and delivered, as the law requires. Certain documents, purporting to be accounts, appear to be occasionally delivered, but with great irregularity. One, purporting to be the accounts made up to Dec. 31, 1876, was not audited till the following 5th of April, 1877. Ten days after that date, a copy should have been forwarded to the Clerk of the Local Board of Standish; but no such copy reached him until January 18, 1878. By this delay the Corporation have rendered themselves liable to a fine of £666; and, supposing the same thing to have occurred to the four other local districts which the Corporation supply, an enormous forfeiture has been incurred. The Wigan Improvement Act gives the Corporation power to apply surplus profits to public purposes; but the Corporation have a rather novel way of relieving the rates. The salaries of their officers are, of course, paid by the ratepayers; and it was to relieve them, we presume, that when an Assistant Town Clerk, was appointed, it was especially directed that his salary of £150 a year should be paid out of the gas funds. We cannot suppose that the management of the Gas Committee of Wigan is a typical instance, but it shows clearly what Corporation management may be, especially in the way of account-keeping. That an experienced Accountant is required at Wigan seems very apparent. According to Mr. Templeton, some items appear and disappear in a most remarkable manner. There is the remnant of the Company's reserve-fund to be seen in the balance-sheet one year, it disappears the next, and turns up again in the following. In the meantime, Mr. Templeton discovers a corresponding sum rambling about the accounts as a renewal-fund, and this he conjectures is the lost reserve. We are happy to see that there are no complaints of the manufacturing department. The make of gas is good, and the quality, as a rule, excellent. It would be an extraordinary thing if no fault were found. The outlying Local Boards do complain at times, and it has been suggested that they should all combine and appoint a Gas Examiner. We are certain to hear a good deal more of this matter. Mr. Templeton's pamphlet will rouse the ratepayers of Wigan and the Local Boards to lively action. It must be shown to be a libel, or the Gas Committee must be content to rest under the imputation of having been guilty of the grossest mismanagement.

Several provincial Gas Companies have held their meetings during the past week. It is gratifying to find that a general state of prosperity continues. The Directors of the Ipswich Company were able to recommend full statutory dividends, with the allotment of £900 to the reserve, carrying forward a good balance to next account. We hope that all agitation at Ipswich has now ceased, and that the Company will continue to hold their position in a well-established state of prosperity. The Leominster Company have been no less successful. They also pay full dividends, and carry forward a small balance. The Reading Company, as a matter of course, pay full dividends, and will continue to do so unless the heavy rates to which we alluded last week, when noticing the financial results of sewage farming, drive half the inhabitants away. The Wakefield Company have been even more successful. They, too, pay full dividends on all classes of shares, and, beyond this, are able to pay up some arrears, or "backwardation" dividends. Thus 6s. 3d. is allotted to every £25 share, 1s. 2d. to every 1847 £5 share, and fourpence on each 1853 £5 share. We have a very shrewd suspicion that the Bill just introduced by the Lord Chancellor will put an end to the payment of back dividends in the future. The Canterbury Gas and Water Company pay their usual dividend of eight per cent. We are happy to see that the Barnet Gas and Water Company continue to make progress, and at a more rapid rate. The receipts for gas increased by £358 over the sum received in the corresponding half of last year. The receipts for water in like manner were £301 in excess of the sum received last year. The Directors were able to recommend a dividend of  $4\frac{3}{4}$  per cent. on the A shares and stock, and a dividend of  $3\frac{3}{4}$  per cent. on the B. stock. The Poole Gas Company pay full dividends, but have to take a small sum from their reserve. The Directors are sanguine that next year they will be able to pay full dividends out of profits alone, and there seems good reason for the belief. Last year the enormous amount of unaccounted-for gas was mentioned. The loss amounted to  $33\frac{1}{2}$  per cent. of the make, and thus one-third of

the gas manufactured went to the winds. A portion of the mains have now been overhauled, and the result has been that, at the present time, the leakage has been reduced to  $16\frac{1}{2}$  per cent., or just one-half. The saving is very considerable, and, as we said, will probably allow the Directors to pay full dividends out of profits, and, let us hope, permit them to reduce the price of gas. A curious feature in the revenue account is that on the credit side appears the entry, "By public lamps—none." Our readers know that, in consequence of a dispute about price, the Local Board of Poole have adopted the plan of lighting the streets by means of petroleum lamps. This appears to be continued. We rather think that the Board made a contract with the Inventor of the lamps for three years. We have been told that the inhabitants are heartily sick of them, and will be glad to see gas re-established.

The Elland Local Board have been opposing the Elland Gas Company in their endeavour to obtain from the Board of Trade a Provisional Order to empower them to raise further capital. Several complaints were made against the Company. The first was that they had capitalized borrowed money, and distributed it among the Shareholders. These shares were, of course, entitled to ten per cent. The Local Board prayed the Board of Trade to reduce the interest payable on these shares to five per cent., but it having been found they had been dealt with, it was acknowledged by the Board of Trade that it was impossible to reduce the dividend. The next thing objected to was the amount of new capital asked for, which the Local Board considered excessive. On their representation, the Board of Trade reduced it by nearly one-half—viz., £20,000 instead of £35,000. Then came the standard price of gas. The Company will, of course, be subjected to the sliding scale, and the Board of Trade were desirous of fixing the initial price at 4s. 2d.; but the Local Board objected, and proposed 4s., to which the Board of Trade assented. The Board of Trade have also given the Company power to charge interest at the rate of five per cent. on all accounts not paid within a month. Such being the case, the Company will, we hope, give a discount of five per cent. on all accounts that are paid within a month. That would only be a fair proceeding.

Jarrow and South Shields are protesting against the price charged for gas by the South Shields Gas Company. The price up to the present time has been 3s. 6d. per thousand, and the agitators wish to have it reduced to 3s. per thousand. A good deal of nonsense has been talked about the cause of the increase of the gas bills; one gentleman at Jarrow ascribing it to the wet meters, by which the Company have lately replaced their old dry ones. If any of the complainants will apply to Mr. Warner, we are certain he will receive satisfactory explanations on this point, and if the price of gas could be reduced without affecting the legitimate interests of the Company, we are certain that the reduction would at once be made. Since writing these remarks, we learn from the report of the Directors that they intend to make an immediate reduction of threepence per thousand. We may mention here that the West Hartlepool Gas Company have reduced their price to 3s. 4d.

Adopting the Burghs (Scotland) Gas Supply Act, the Town Council of Dumfries have acquired the undertaking of the Dumfries Gas Company by arbitration. The price awarded is £21,000 for all interests. The Corporation take possession of the works on Whitsunday.

Major Tulloch is a very obliging man; people will not borrow enough to please him. The Corporation of Droitwich asked the consent of the Local Government Board to borrow £5000 for the purchase of the gas-works; but the Major, after rather severely examining the Town Clerk, strongly advised them to ask for a larger loan, and the Corporation went away to consider how much they should apply for. *Verbum sap.*: When attempting to borrow under the sanction of the Local Government Board, always ask for more than you require.

We have repeatedly said that we are always gratified when Gas Managers put themselves before the consumers, in order to teach them the "Economic Use of Coal Gas." Yesterday week Mr. M'Crae, of Bury St. Edmund's, delivered, under aristocratic auspices, a very interesting lecture with the above title. Starting with a general history of the manufacture of gas, Mr. M'Crae went on to describe the photometer and the method of testing the illuminating power of gas, and, by a natural transition, passed to burners and fittings, which latter he recommended his audience to have professionally examined, at least once a year. We need not follow the lecturer all through his discourse, which our readers may, perhaps, some day find in our columns. There are, in the course of the lecture, a few small slips which are of no consequence; but we can assure Mr. M'Crae that chimney smoke is not combustible gas.



We publish, with more reluctance than most of our readers can conceive, a letter from Mr. George Anderson, on the past and present management of the British Association of Gas Managers. Agreeing with the writer that the past management has not been everything that could be desired, we should, nevertheless, have hesitated to publish the statements made, if we were not convinced that Mr. Anderson's sole desire is to promote the welfare of the Association. The first fact pointed out is, that the expenditure of the Association has for some years been in excess of its income—a fact which calls for the gravest attention of the Committee. An increase of members, according to Mr. Anderson, brings no benefit to the Association, for whereas, in 1875, 596 members contributed £426 6s., in the following year 604 paid to the funds only £396. It is clear, as Mr. Anderson puts it, that the subscriptions must be more rigidly collected. We feel a diffidence in following Mr. Anderson through his remarks on the necessity for a reconstitution of the Association. No doubt something will have to be done, but whatever be done it must be with a gentle hand; the Association must be preserved. We have repeatedly expressed a fear that the Provincial Societies, now so numerous, might, in the long run, prove detrimental to the interests of the Parent Association. No doubt a number of valuable papers are withheld from the Association, to be contributed to a minor society. This is often caused by timidity on the part of members, who shrink from hostile criticism in the face of a large audience. This fear is not so much felt in the provincial meetings, in which the members are, more or less, known to each other. We shall say nothing of Mr. Anderson's remarks on the duties of the President for the time being. Presidents of all Societies have an acknowledged right to speak when, and as often as, they please; and, so far as we remember, no President of the Association has ever abused this right. In the case of some, indeed, we have thought that they did not sufficiently exercise it. It would, we imagine, generally be found impossible to fix inexorably the order in which the papers should be read at the meetings, unless the writers of them were locked in a jury-box, and let out as they were wanted. It is unnecessary for us to go into the financial condition of the Association; but we may admit, once and for all, that it is very unsatisfactory. How to restore it to a healthy state is the problem that lies before the Committee. With the hearty support of the members, the restoration may soon be effected, and the affairs of the Association placed on a firmer basis. Mr. Anderson makes an excellent suggestion, and that is the election of two classes of members, with differential rates of subscription, the present one being the lowest receivable. It seems clear, as Mr. Anderson puts it, that if the single half guinea subscription be retained, the Association must, in some way or other, reduce its expenses. We have nothing to do with the Secretary's salary. The Committee have a right to pay that officer what they please, always supposing the Association can afford it. We may just mention, however, that the duties of that office are much more onerous than some people seem to suppose. Besides attendance at the annual meeting and the meetings of the Committee, the Secretary has to conduct a large amount of correspondence all through the year. The members of the Association are an inquiring class, who are always asking for information, which the Secretary is expected to furnish. We fear that Mr. Anderson's passionate appeal to leading Gas Engineers for contributions to the Society's proceedings will not be responded to. It was, however, quite right to make it. His letter, we expect, will give rise to a good deal of correspondence, which we only hope will not be of an acrimonious character. Sound judgment, exercised with calmness and tact, will soon put the affairs of the Association in order, and everything will go well again—a consummation we wish as devoutly as Mr. George Anderson.

The half-yearly meeting of the Cork Gas Company took place on the 11th inst. The usual dividend of eight per cent. was declared, with an additional one per cent. on the capital paid up in 1873, the dividend on which is in arrear. The Company are about to make an effort to stimulate the consumption of gas for other than illuminating purposes. With this object they will open a show-room in the city, where heating and cooking apparatus may be seen in operation. Their able Engineer, Mr. Travers, has also written a small tract setting forth the economy of the use of gas, which we sincerely hope will assist in promoting the object which the Directors have in view.

Only a few years ago the Corporation of Hereford bought, at very great expense, the undertaking of the Hereford Gas Company. Foolish people thought the works obtained would last for ever, and prophesied, soon after the acquisition, that rates of every kind, except the gas-rate, would be unknown in Hereford. The consumption of gas, however, has gone on increasing, and the existing works are now scarcely sufficient to supply the

demand. Two courses are, therefore, open to the Corporation, who are advised by Mr. G. W. Stevenson. They may add to the existing works, at an estimated cost of £14,030, or they may acquire a new site, and erect altogether brand new works, at an outlay of £25,820. The latter plan is recommended by Mr. Stevenson. The Town Council have not yet decided on the course they will pursue; but it is quite clear that they will soon have to make a considerable addition to their capital debt for gas purposes.

We have no doubt that the Southern Association of Gas Managers have very pleasant meetings at that quiet hotel in Southampton Row. According to Mr. Eldridge, the new President, every member feels perfectly at home, talks freely, and stands perfectly unabashed in the presence of his brethren. There is no nervousness such as will, in a short time hence, be exhibited in the Adelphi. The picture of the meeting is perfectly idyllic. Mr. Eldridge tells us that most members have something to say in the course of the meeting. We are rather glad this is not the case at the meetings of the Parent Association, or the discussions on a couple of papers would suffice to occupy the time of the whole meeting. The full text of the new President's Address, which possesses much interest, will be found in another column. It is a novel feature of this Society that the President selects the subjects for discussion, much in the way they do at Cogers Hall. We must say we like the plan; a member knows what is to be discussed, and can read up the subject before he starts to the meeting prepared to take part in the discussion.

The Directors of the Sheppy Gas Company have offered to furnish gas-fittings to their consumers on the new hire system. They propose to let the fittings for three years at small rentals, and, at the expiration of that time, to sell them for half their cost. The Company have for years lent fittings on hire for unlimited periods, and have found that the system has stimulated the consumption of gas. By this new step, they hope to promote a still larger consumption, and we wish them all success. In another column will be found the scale of charges, which it will be seen is extremely moderate.

### Water and Sanitary Notes.

THE Water Committee of the Corporation of Manchester have just presented their report upon the past, and estimates for the present year. Water affairs in Manchester are so complicated, that it would be impossible, in the space we could spare for the purpose, to give an intelligible account of them. The Corporation have been in possession of the water-works for twenty-eight years, and have now a capital of a little over £2,500,000 invested in them. From the commencement until the present time surplus profit has only been realized in two years, and then to a very small amount. It was asserted by some in the Council, but denied by others, that a sum of £21,000 has been lost in the course of the same time. If this be the fact, it is no great matter for Manchester. A rather stormy discussion arose in the Council on the motion for the adoption of the report, and charges of mismanagement were freely brought against the Water Committee, but these charges were not well supported, although their policy on some points may be questionable; as, for example, when they tempt manufacturers to take large quantities of water by selling it at a very low price—4½d per thousand gallons. The water in such a case must be sold under cost price, and the manufacturer has no motive to be economical in its use. This, in a period of drought, becomes a great evil. As great differences of opinion exist, even in the Town Council, as to what is the actual charge for water in the city, we can express no opinion on the point; but we may hazard a conjecture that, taking into account the public and private rates, water is dear in Manchester. Some of the speakers appear to think that the out-townships are supplied with water at the expense of the city. The Town Council are now divided into Thirlmereites and anti-Thirlmereites—the latter opposing the reception of the report of the Water Committee.

The Corporation of Brighton are very much more successful with their water-works than the Corporation of Manchester. The Water Committee of the former, last year handed over to the Finance Committee upwards of £2000 out of surplus profits, and they have just given notice to the same Committee that in making their estimates for the next borough rate they may take credit for a sum of £4000 which the Water-Works Committee will hand over to them. We do not know what a penny in the pound produces in Brighton, but it looks as though the water-works had really brought some relief to the ratepayers. As in the case of gas, so in the case of water, we object to the appropriation of surplus profits to general public purposes. The Manchester Water Act provides that all such profits, if any be



realized, shall be applied in the reduction of the water-rate. It is a pity that a similar provision was not made in the Gas Act. Water at Brighton is certainly too dear; the inhabitants, especially of smaller houses, complaining bitterly of its cost. If these yearly balances go on increasing in amount, we should hope that the Water Committee will take into serious consideration the propriety of reducing the water-rate.

It would be worth a revolution in this country, if it were bloodless, if we could get rid of counties, petty sessional divisions, unions, and parishes. For legal purposes they only create confusion, and, perhaps, contribute to the income of lawyers. One of these days, perhaps, a genius may arise who will map out the country into areas for legal and sanitary purposes according to its natural conformation; but that day is probably distant. No effectual drainage or water supply scheme can be satisfactorily settled until this is arranged. These thoughts are suggested by the County Government Bill, the weakest measure, perhaps, the present Government have produced. It is neither fish, flesh, nor good red herring, and, taken together with its congeners, the Highways and other Bills, can only make confusion worse confounded. It is quite time that individual units of area should be mapped out for all administrative purposes. They manage these things better in France and elsewhere.

The undertaking of the Shrewsbury Water Company has been transferred to the Shrewsbury Corporation, in consideration of a lump sum of £46,000. The works are for the present to be carried on as usual, but we believe that extensive additions are contemplated.

The opposition to the Bill of the Sevenoaks Water-Works Company is now completely withdrawn, and it will go forward unopposed. All idea of purchase by the Local Board has ceased to be indulged in, it having been made very apparent that the Ratepayers are perfectly satisfied with the Company.

The New River Company have succeeded in obtaining judgment in their favour in the case of their appeal against the assessment to the poor-rate in the parish of St. Mary, Islington. The question in dispute was a very simple one. It was merely this: Is an assessment made under the quinquennial Act to last five years, or may it be varied and increased by the Assessment Committee of any parish? The New River Company of necessity are continually adding to the mileage of their mains in the parish of Islington, in which building operations are rapidly proceeding. It is claimed for the parish that the additions should be rated as fast as they are brought into profitable occupation. The contention of the Company we have stated above. The judgment of the Magistrates was unanimous in the Company's favour; but the case will, of course, be carried to a Superior Court. As we are precluded from expressing an opinion on this case, we will put another. Jones's Islington villa has just been valued for assessment under the five years Act. He pays his water-rate, of course, according to that valuation. Jones, having increased his wealth, thinks he will add to the value of his house; he, perhaps, puts on another storey, places a conservatory at the back, and, perhaps, sets up a stucco-portico before his front door. All these things would, undoubtedly, add to the value of his house; but what would be said if the Water Company or the Assessment Committee added to their rates in accordance with their view of the increased value of Jones's house. It would, of course, be contended for Jones that the house had been valued for five years, and the valuation must last for that period, after which the portico and the conservatory may be taken into consideration.

At a very opportune time, Dr. C. M. Tidy publishes a report on the London Water Supply, addressed to the Metropolitan Medical Officers of Health,\* and, for their better information, includes analyses of the London waters, which have been made by Dr. Letheby and himself during the past ten years. The object of this is, of course, to show the constancy of the composition of the waters supplied to the Metropolis. The book is full of tables of analyses, which, we fear, few people will study, and we do not know what good it would do them if they did. They go, however, to prove that the Metropolitan waters are, chemically, of excellent quality, while all honest medical experience acknowledges they are perfectly healthful. On this point Dr. Tidy expresses himself as follows:—"I venture to state—and the analyses I now place before you justify me in the assertion—that the water supplied to London, the healthiest City in the world, is as excellent in quality as it is liberal in quantity. The Kent Company's water, although reported to be loaded with previous sewage contamination, is, undoubtedly, of excellent quality;

"nevertheless, although I have most diligently considered and compared the death-rates, and also, as far as possible, the causes of death of different parts of the Metropolis supplied by the Thames water, the Lea water, and the water from the chalk wells of the Kent Company respectively, I have failed to discover any differences worth noting in the death-rates, or any evidence whatsoever that any special class of disease has been prevalent from drinking the waters of the Thames and Lea, or absent from the use of the chalk water." We can cordially endorse all that Dr. Tidy says in the concluding paragraph in his report. It is perfectly scandalous that such statements should be circulated as that which he quotes from the Sixth Report of the Rivers Pollution Commission. A careful examination of the death-rates of different districts shows that the rate of mortality is practically the same in all, whatever the source of the water supply. In what locality cholera would fix itself if it again visited London it is impossible to say, but we are certain that Deptford would be as liable to an outbreak as Whitechapel. We may thank Dr. Tidy for his able defence, not so much of London Water Companies as of London water.

**EXPLOSIONS IN COAL MINES.**—Mr. T. Wills has been delivering a course of lectures on this subject at the Society of Arts. In the course of them reference was made to some considerations connected with safety-lamps, the effect of barometric and thermometric alterations, and the part played by coal dust in explosions. As regards safety-lamps, it has long been known that a strong blast of wind will carry the flame through the gauze and ignite inflammable gas outside the lamp; but it appears only to have been recently made out that a very slight concussion, or even a puff of air, if sufficiently sharp, will have the same effect. This was shown by firing a mixture of air and gas surrounding a lighted safety-lamp, placed at the end of a long tube, by the concussion produced by a pistol shot at the other end, a flexible diaphragm being fixed across the tube to prove that the effect resulted merely from a concussion of air. It was remarked on this that the firing of a shot in a mine might readily drive the flame of a lamp at some distance through the gauze, and so ignite the surrounding fire-damp—all the lamps being afterwards found uninjured—without anything to show how the accident had been caused. With regard to the photometric value of different lamps, the lecturer stated that some interesting results had lately been arrived at. With all the English lamps in which glass is used it is found that the mere addition of the glass chimney or cover diminishes the light by about a third; but with the Muesler or Belgian lamp the arrangements are so contrived that the addition of the chimney increases the combustion in a corresponding degree, and so there is no loss of light at all. On the point of meteorological changes, Mr. Wills remarked that many great explosions, such as those last autumn at Blantyre and Wigan, could be distinctly traced to falls of the barometer, not immediately before, but some day or two before; and he urged that it was not sufficient to consider only changes in the few hours preceding the catastrophe, as had been generally done in such investigations. The effect of a mixture of fine coal dust was shown by a striking experiment, in which a perfectly non-inflammable mixture of air with a small proportion of gas fired immediately when a little fine coal dust was shaken up in the bottle containing it. As in many dry mines this dust exists in large quantities, it was evident that it might often be the cause of otherwise inexplicable explosions.

**BURY ST. EDMUND'S GAS COMPANY.**—The half-yearly meeting was held on the 8th inst.—Mr. G. Thompson in the chair. The Directors report recommended a dividend for the half year ending Dec. 31, 1877, of 10s. per share on the old capital, and 6s. 4d. per share on the new capital, free of income-tax. In moving the adoption of the report, the Chairman said at the present time the capacity they had for making gas was about 250,000 feet in 24 hours, and the largest quantity they had been called upon to supply—that was, the greatest demand in one day—was 189,000 feet. The conclusion inevitably drawn from that fact was that they had every appliance and sufficient room to carry on the works, and that the Company were in a condition to meet any demand which might in the future be made upon them. As to the revenue account, they stood, he thought, as well as could be fairly expected. They were as careful as they possibly could be in the management of their accounts, and every expense came before them as Directors. Nothing was paid except with their own immediate knowledge, and the accounts likewise went before his friends, the Auditors, and then showed the satisfactory results which the Shareholders could that day witness. He might mention that on the last day of December the Company did not owe £100, so careful had they been in regulating their expenditure, and following what they considered to be the best plan—viz., settling all the debts they could as they went along. He would mention another satisfactory thing—viz., that their bad debts, amounting to £25 or £35, had been almost all recovered. From all this he thought the Shareholders would feel that the Company were in a prosperous condition. The dividends would be at the same rate as on the previous occasions; and he hoped that, before leaving, those present would look over the works, for they were clean, in good condition, and well worthy of being visited by them. To produce these satisfactory results it needed a thorough business man, with a sound judgment, at the head of the works, and that, he thought, they had in their present Manager, Mr. M'Crae. He had been very careful and active in the fulfilment of his duties, and he (the Chairman) could not allow the opportunity to pass without expressing to him the satisfaction and gratification of the Directors at the manner in which he filled the position he occupied. The report was adopted, the dividends declared, and the retiring Directors and Auditor re-elected. Thanks were voted to the Directors and Auditors, also to the Secretary (Mr. Salmon), and the Manager (Mr. M'Crae). The Secretary, who seconded the vote of thanks to the Manager, said he had admired the masterly way in which Mr. M'Crae had laid the different matters in connection with the works before them, and had seen his great skill as an Engineer as well as a Manager. He had saved the Company hundreds of pounds by the practical engineering ability which he brought to the work. He (Mr. Salmon) did not say these words as empty flattery, or as a compliment, but he said them because he knew they were deserved. His (Mr. M'Crae's) ability as a gas maker was equal to his ability as a Manager, and no one knew how much the Company were indebted to him. Their Company had been fortunate in their Managers, for their last able Manager (Mr. T. H. Methven) had been followed by an equally able successor. Mr. M'Crae having acknowledged the compliment paid to him, the proceedings terminated.

\* "The London Water Supply," being a report submitted to the Society of Medical Officers of Health on the quality and quantity of water supplied to the Metropolis during the past ten years. By Dr. C. M. Tidy, M.B., &c., &c. London: J. and A. Churchill, 1878.



# A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLIX.

PUBLIC LIGHTING (*continued*).

The supply of gas to the street-lamps has been, and in some places still continues to be, a fruitful source of disputes between Gas Companies and Local Authorities. The differences arise principally on—(1) The price of the gas; (2) Its illuminating power; and (3) The quantity of gas consumed by each jet.

The price of the gas formerly, more than now, was a cause of contention. In past years, the price charged, in many instances, was so low as to be unremunerative to the Company, and, in some cases, the gas was actually supplied to the public lamps at a rate of charge below the cost at which it could be produced and distributed. This was more particularly the case with Companies who, not possessing special Acts of Parliament giving them power to open the streets for the laying and repairing of their mains and services, were desirous of propitiating the Local Authority with a view to securing immunity from complaints, and legal proceedings for the damage thereby necessarily occasioned. The burden was thus unfairly thrown upon the private gas consumers, who had to pay a price for gas sufficiently high to recoup the Company for the loss sustained by the public lamp-lighting.

This mistaken policy has very generally been abandoned, and a fairly remunerative price is usually obtained for the street lights. The Local Authority are, in most towns, one of the largest customers of the Gas Company, and the salutary rule of charging for the gas consumed in the lamps at the minimum price paid by other heavy consumers is now the recognized custom. This is a reasonable and just arrangement for all parties.

Another bone of contention has been the illuminating quality of the gas supplied. On this head, however, there is scarcely room for reasonable dispute. Private Acts of Parliament generally, and those of recent date invariably, fix a minimum illuminating power, which is greatly exceeded in most instances; and the results of systematic testing by a properly qualified officer, are usually accepted as satisfactory by both sides.

The consumption in public lamps is generally regulated for common gas up to 17 candles value, at 5 cubic feet; and for canal gas, from 30 candles down to 18, at 3 to 4 cubic feet per hour. Before the invention of the lamp governor, the difficulties in the way of limiting the consumption to the proper supply were insuperable. Instead of the quantity specified above, 20 to 30 per cent. more gas passed through the burner. This arose from causes easily explained, and now well understood, due principally to unsuitable and badly constructed burners, the irregular levels of the district lighted, and the varying pressures during the hours of consumption.

The effect of this excessive consumption of gas was not by any means an increase in the lighting power of the lamps. Had that been so, the complaint could scarcely have arisen. It was just the directly opposite—faulty illumination. This naturally led the inexperienced to believe they were defrauded by the Company, and that short measure was being given. It is a happy circumstance for the gas supplier that the result of an excessive supply of gas is a worse light. There is much that is paradoxical in gas lighting, and in gas manufacture generally. The evil wrought its own cure, by leading to the discovery and application of a remedy. The lamp governor was invented, gas-burners of an improved type were introduced, and the average meter system was gradually adopted. Important and valuable as was the governor, it found a rival for a time in the system of double taps, one of which was permanently adjusted to give the destined supply during the whole of the lighting hours, and the other was for shutting off the gas during the time of non-lighting. This, absurd as it may now appear, found influential advocates in various quarters, but the fallacy of the system was so self-evident that it scarcely needed the ridicule that was cast upon it to cause it to be generally abandoned.

There can be no doubt that supply by meter solves the question of satisfactory street lighting. The able and persistent advocacy of Mr. J. O. N. Rutter, during many years, has done much to encourage the employment of the meter in the registration of the gas consumed by the public lamps. It is to the interest of both Gas Companies and Local Authorities to adopt the meter.

There are those who advocate the application of a meter to each lamp. Were it not for the expense, this is perhaps the most satisfactory method of supply. The cost of such meters, singly, would not equal the cost of those required under the average system, as a smaller size of instrument would be admissible.

It has been proposed to have a separate system of mains for the exclusive supply of the public lamps, and to have the consumption of the whole registered by a special meter. This is quite unnecessary, and, indeed, may be said to be impracticable, if economy is to be considered. A system of small mains with innumerable joints would give a loss by leakage altogether disproportionate to the consumption, or to the supposed benefit to be obtained. The like remark applies to the proposal to have a distinct meter through which to register the consumption of the lamps in each street.

The average meter system has proved itself to be sufficient for all practical purposes. It is important, however, that it be carried out in a proper manner. For instance, it is a delusion and a snare to attach, as is done to our knowledge, some half dozen dry meters, or even wet meters, of the smallest size, to the like number of lamps, in a district embracing two to three hundred columns, under the idea that such an arrangement is the average meter system. This but exaggerates difficulties, and leads to periodical bickerings and dis-

putes. Not less than one meter in every fifteen lamps should be employed, and one in ten or twelve is desirable. To every lamp, whether metered or unmetered, a governor should be attached, and both meters and governors should be tested, and adjusted if required, annually, at the beginning of the heavy lighting season.

The fullest and best exposition of the average meter system is that given by Mr. Charles Hawksley, being a description of the Nottingham public lighting arrangements, in a paper read before the meeting of the British Association of Gas Managers in 1868,\* and to this we direct the attention of our readers. Mr. W. Sugg, who supplied the apparatus for Nottingham, has contributed some improvements to the arrangement since that time. Messrs. A. Wright and Co., Messrs. W. and B. Cowan, Messrs. D. B. Peebles and Co., and other firms of repute, also produce special meters and the other appliances required, and many towns have successfully adopted the apparatus of these several makers.† There can be no doubt that eventually the system will be universally applied, even in those places where the manufacture and distribution of the gas are in the hands of the local authorities, whose duty and interest it is, as much as that of a private company, to prevent waste, and promote efficiency in the public lighting.

(To be continued.)

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### UNDER THE MICROSCOPE.

SIR,—The Council of the British Association of Gas Managers undertook, at the Bristol Meeting, last June, to consider certain changes proposed in the constitution of the Society.

Murmurs have been heard for some years, and they grow louder. If the Committee do their work thoroughly, they will earn the best thanks of the members. If they smother up grievances, or show, by their mode of dealing with the matter, that they do not understand the feelings of the members, they will but water the seeds of decay, which, parasite-like, are choking out the life of the Society.

The best constitution in the world may be badly managed. I see very little wrong in the constitution of this Association, but I do see a want of wisdom in the management, and I think the blame is not to be cast on any one body or class, but should be accepted by the whole Society.

It is the duty of the Council, no doubt, to be careful that they shall not ask the vote of the Members on any injudicious proposition, but, should they do so, it is equally the duty of Members to state their opposition and withhold their vote. The Society has generally exhibited a "Support the Committee" sort of policy, which is highly to be commended where it is exercised with judgment; but it has also the effect of stifling inquiry, for few men care to be making propositions that they have no expectation will be carried, although they know that the same things are "talked of in the lobbies."

With this prologue, I will now state some views which appear to me worthy of the attention of the Society. From the nature of the subject, and the conclusions I have come to, they will necessarily be unpleasant to some, and, feeling this, I have debated with myself whether I should take any part in trying to shape the future. Feeling said *don't*, Conviction said *do*, and Caution said *wait*. I took Caution's advice, and waited; but Conviction and Feeling have both kept the subject awake, and after several audiences Conviction has carried its point, and, under its direction, I proceed, telling Feeling that its injunctions shall be attended to as far as is consistent with a proper statement of the case.

In undertaking this task, I am alive to the criticisms I may have to encounter, and (that no false issue may be raised) I start by stating that my sole object is the welfare of the Society. I seek no position for myself—none. If offered it, I will not accept it. I simply, as a Member of the Society, lay my views before it in the most public manner I can, believing that the more publicly it is done the more effectually it will be done; and if the result be any benefit to the Society my object will be gained.

It has occurred to me also that criticisms may take this form: "What! You find fault, yet will not assist in working a remedy." To that my reply is, that I consider it better to carry out a policy of self-abnegation than to be misunderstood by not expressing myself plainly. If I see a man about to walk over a precipice, it is enough that I show him his danger—he has no claim on me to carry him out into the safe road.

According to the last published accounts the expenditure for the year amounted to . . . . . £468 12 0  
The income for the same period from members subscriptions, sale of reports, and interest on invested capital, was . . . . . 423 6 6

Leaving a balance of loss of . . . . . £45 5 6  
The income shows that from 517 members a sum of £385 10s. was obtained; but, if each of those members had only paid the prescribed 10s. 6d., the income would only have been £287 3s. 6d., which would have resulted in a further loss of . . . . . 98 6 6

Making a total loss for the year of . . . . . £143 12 0  
Donations and entrance fees from extra-ordinary members amounted in the year to £30 5s., the whole of which was absorbed in the working expenses; but still the balance in hand at the end of the year was less than at the beginning, by the amount stated. Donations and entrance fees of extra-ordinary members should rather go to increase the balance in hand than to meet current expenses, because they are uncertain sources of income that cannot be depended on.

One thing seems certain. The Society must either cut down its

\* JOURNAL OF GAS LIGHTING, Vol. XVII., p. 489.

† These will be fully illustrated and described in the "Treatise," as published in a separate form.



expenses or increase its income; it cannot subsist long on the savings of former years.

One naturally looks for the cause of this decadence. Has the Society become unpopular, and the number of members fallen off? On the contrary, the country has rallied round it in an extraordinary manner—it enrolls half a hundred members at a time. The number has increased from 259 in 1870 to 604 for the last year, being an annual average increase of 57 members for each of the last six years; and, instead of contenting themselves with paying the prescribed 10s. 6d., many have paid from one to three guineas each. The Committee give their services gratuitously, and every second year the place of meeting is given free by the London Society of Arts.

If efficiency were as marked as, in those two instances, economy is, the Society should be most flourishing; but, in the face of this, the expenses of management increase, even in a greater ratio than the increase of members. This is a paradoxical state of circumstances. Gas managers can conduct their gas-works more cheaply in proportion to the amount of business done. They seemingly cannot so conduct themselves.

Six years ago the expenditure per member was about 12s., now it has risen to 18s. 6d.

In the years gone by there has been as much as £114 balance, after paying expenses; last year there was a loss of £15, without including the donation and entrance fees, which increase the loss to £45. The increase of members, however, does not seem to increase the income; for, in 1875, with 596 members, there was received £426 6s.; while, in 1876, with 604 members, only £396 0s. 11d. was received. The Society is either introducing a great many weeds or dummies, or its funds require a better mode of collecting. In 1875, out of 596 members, only 475 are credited with having paid their subscriptions, and, for 1876, only 470 have paid out of a total of 604. With so many "consumers in arrear," the Society is likely to make "bad debts" unless defaulters are "cut off;" and the Committee had better look to it.

We do not allow our consumers to be two quarters in arrear; why should we be more generous to ourselves? It may sound fine to count so many "stands of arms;" but will they shoot? I do not believe in polishing and burnishing up a fraud; let us cease that mutual tickling, and complimenting each other on what fine fellows *we* are, until we have cleared out the withered excrescences that cling to us and retard our successful progress.

For several years, half-suppressed growlings have been heard—at luncheon-time, and at corners where members meet. These factions are growing larger and louder. They now talk publicly of re-organizing the constitution of the Society. A motion to the latter effect was made at the Bristol Meeting, and probably would have been carried, had all who agreed with the principle of the motion voted for it. I hope the Committee will appreciate the forbearance, and escape such "rocks ahead." Motions of this kind are sometimes destructive; there is generally cause for them. People, whether in large or small societies, usually rub on as well as they can, and as long as they can. It is only when things are no longer bearable that they revolt, and wise guides foresee this and introduce reforms; egotists resist and fall.

There is a feeling—mostly expressed by country members—that the constitution of the Society is of too centralizing a character. This is an old complaint, as old as the Republics of Ancient Greece, and it led to the downfall of that nation, and the absorption of its parts into the surrounding ones, until it has become

"Greece, but living Greece no more."

But might the Republic not have stood, had the Athenians paid more respect to the provinces? On a much smaller scale, but alike in principle, may not the provincial societies become more attractive than the national one? and is the falling off of payments any sign that they are so? Are they better constituted, or more freely governed, or better managed? Do members find their local bill of fare more attractive, more invigorating, than the national one? They have now the means of making comparisons.

These are questions the British Association should inquire into, and not feel any shame in taking a lesson where they can. For instance, is the character of the papers read being maintained in their general interest and usefulness? If not, how can they be made so? Has the system of granting premiums realized the expectations that created it? Have the awards that have been made exhibited a wise judgment on the part of the Committee—in other words, has the value of the awards been fairly representative of the value of the papers read, apart from the persons who may have read them?

Having established the system of premiums, nothing can be more difficult for a Committee than to make awards that will give general satisfaction, and any administration of it that savours of favouritism is sure to do far more harm to the Society than if no award whatever had been made.

The last balance-sheet exhibits a curious view of the premiums. There are the items—Baddeley Brothers (President's medals), £3 14s. How many medals go to £3 14s. is not stated, and it would be interesting to know, because the medal is called the First Prize. Then there comes the Second Prize, value £10, and the third, value £7, and a still lower prize of £3.

Apart from the honour of the thing, the Third Prize is intrinsically considerably better than several of the first; and if the Society wish to do honour to its members who take the trouble to prepare papers, the granting of medals, in the present state of its finances, would be the more economical policy.

A custom has prevailed from the first, which I think it would be an improvement to alter—namely, the President giving his views on a paper after the discussion has closed and the reader of the paper has made his reply. I have heard a President make remarks on a paper which were unwarranted by anything stated in it. If a President wishes to express his views, the best time would be immediately before the reply, so that what he says may be taken account of by the reader of the paper, should he think fit. I submit also that unless a President has something to say beyond complimenting the writer of the paper, he may do that in fewer words than it is sometimes done in. A garrulous President is a bore, unless the discussion has flagged and the papers are few or unimportant; then some oily words may relieve the monotony;

but I think it will be throwing too much on Presidents if the opinion should prevail that they are expected to speak on all occasions.

Another point there is on which I have sometimes felt there might be improvement—namely, that the Address of the President should be matter for discussion. I know that such Addresses are not usually so; but that is no reason why they ought not to be. When a President branches out into moral philosophy, political economy, and such like debateable subjects, down to trades unions, there is a great chance of leaving an unsatisfactory impression on some minds, which a little discussion might clear up, or a knowledge of its possibility might prevent the debateable grounds being entered on at all.

I fancy some respectable, "well-regulated" minds may consider my proposition too radical; but let them, after they have recovered from the effect of the shock, ask themselves, Why? The Member of to-day is the President of to-morrow, and the Member again of the day following. The presidency is a brief authority, that brings with it no opportune addition of intelligence; therefore, if what a Member says may be discussed, why not that said by a President? The more important a matter is, the greater is the desirability that it should be free from admixture of error. An address, like a patent, that has stood the test of examination is more valuable than one that has not passed through this ordeal. Even the Address of Her Majesty to Parliament is a subject for discussion, and it is an evidence of a healthy political state that admits it. Think you Ministers would be as careful as they now are if they knew the Address could not be the subject of animadversion?

I do not make this proposal out of disrespect to past presidential addresses, for I think, as a whole, they have been very good; but I contend that no man should stand up to speak to his fellow-man on any subject, or on any occasion, unless he be prepared to be questioned. The good sense of gas managers as a body would always prevent any chance of such a procedure degenerating into an abuse.

A practice has arisen of late which has earned the condemnation of every member that I have heard express an opinion. Papers are not read in the order in which they are printed on the card. If a member have a paper to read, he must be in attendance, whether he wishes or not, for he never knows when he may be called on. Or members wishing to hear a certain paper must sit out the hearing of others, in which they may not be interested. I have protested against this to the official authority, and have been told in a sly manner that "it was to keep the members together." I respectfully submit that the members are not children, who require to be bribed or punished into doing their duty. They are the best judges of their own convenience, and as some of them may want to make a call on behalf of their Company, or on their own behalf, the Committee ought to know their own mind sufficiently to enable them to stick to their published programme, and not inflict an unmerited punishment on the members. I know that a member has been absent when his paper has been called on; then pass to the next in order, and bring him in at the last; but conduct the business with something like order. Nothing is so apt to create disorder in the members as to have the example of disorder set them by the governing body.

Touching the financial condition of the Society. I have looked back as far as the year 1870, and find that from 1870 to 1873, inclusive, we had for those four years an average of £80 per annum of receipts over expenses. Since that time we have been declining, until in the last two years, 1876-1877, the balance is on the wrong side by an average of £35 per annum. This state of matters is pointed out at page 112 of the proceedings for last year, in the Financial Committee's report, in paragraph 5 of which they "suggest that members who have expressed their willingness to increase the amount of their subscription when required should now be invited to do so."

The respectability of the three names appended to the report forbids the supposition that this was penned in irony; but who the generous Members were, or whether the Council took the advice and made the application, I know not, although doubtless the next balance-sheet will show. Personally, I object to be represented in this begging fashion. When a prudent man finds his expenses in excess of his income, he does one of two things—he increases his income, or he cuts down his expenses—he does not send round the hat. It would have been more to the purpose—more noble, in my opinion—if the Finance Committee had shown how one or the other of those two alternatives was to be accomplished.

I now proceed to show how either may be reached, and without doing an injustice to any one. I have before now advocated that the annual subscription should be increased above 10s. 6d. But for a number of members (for last year 147) who overpaid their subscription by the amount of £88 7s. 6d., the balance against the last year would have amounted to £103 8s.

Let any one glance down the list, and he will find many members who could well afford to pay more, but are content by paying the legal claim of the Society—namely, 10s. 6d. No one can blame them. There is no Society of a similar kind that I have heard of where the subscriptions depends, not on the ability, but on the generosity of the members, unless in charity organizations. Charity, like outdoor relief, begets pauperism. There are many members who could pay double the amount with ease, but will not so long as others do it for them; just as there are many paupers who can and would work if outdoor relief were withdrawn.

When I have advocated an increased subscription, I have been told it would reduce our numbers. If that be so, I would have two classes of members—a guinea and a half-guinea class, and let the latter be deprived of some element of expense. I dare say the members who can afford to pay only half a guinea would be content to read the proceedings of the Society in the pages of the JOURNAL OF GAS LIGHTING, and forego the printed book; but this is a matter of detail for the Council to ventilate.

Last year the total number of members who paid was 547, of whom 147 paid up to and over a guinea, leaving 400 who paid the legal claim. If only 50 per cent. of those, or 200, could be relegated to a guinea class, the funds would be increased by 100 guineas.

If the Society be bent upon retaining the half guinea subscription, then I say it must reduce its expenses. First, it may omit giving premiums; these amounted to over £20 last year. Secondly, it may



reduce the salary of the Secretary who, at present, receives £140, a year and £40 office-rent, all stationery, postage, and every expense connected with the Society paid besides. From the accounts it appears that the salary of the Secretary has been—In 1870, £25 by minute; in 1871, £26 5s. by minute; in 1872, £50 by vote; in 1873, £50 by vote; in 1875, £100, and office-rent £40; in 1876, £140, and office-rent £40; in 1877, £140, and office-rent £40. The cost of Secretary last year amounted to 6s. 7d. per member who paid subscription, leaving only 3s. 11d. out of the half guinea for all the other expenses. I care not what the salary is, if we could pay it; but while I find that when at the meetings I propose an increase of the annual subscription, ten-and-sixpenny gentlemen get up and oppose it, and when I hear it argued that many members could not afford to pay more, I throw upon those who proposed and those who may support the present expense the onus of proving how it is to be met.

I would much rather see the Society put in a position to pay its way handsomely than that we should make reductions such as I have proposed, although I see, in the newspapers, that the American Government have just reduced the salaries of their officers, from President down, through Ambassadors, all the way to Consuls; and one way to do this would be to charm a little more intellect into it. I could name several men, who think themselves "no small potatoes," whose voices are never or seldom heard. They play the ornamental rôle; but, as we can see a much better get-up at Madame Tussand's for a shilling, they are not useful. Why don't we have papers from their large experience? We are getting tired of gimcrackeries and little knick-knacks. They should not hide their electrifying light under an impenetrable bushel of hah-ha ha-ha ha's. If they don't come out, they will be forgotten. That threat should excite them.

We all remember Galileo and Socrates, but who remembers under what Pope's reign the former was imprisoned, and his books burnt for stating that this world wasn't shaped like a soup-plate, or who it was that ruled in Athens when the latter was condemned to drink hemlock for proclaiming doctrines contrary to the then teachings of the gods?

Of these we may say,

"Kings may forgotten be,  
Sparks in eternity;  
Truths thou hast uttered  
Will rivet thy fame."

You great men "who have sat at rich men's feasts," who have, or who have had, but one gas-work to manage, with store of money behind you, and time and opportunity to make experiments, tell us somewhat of what you only know; give us something to think on, something to debate on; do something to galvanize the walking corpses that will assemble next June. In the name of Allah, I declare we starve, we thirst, we die; "and worse than all, and most to be deplored, as" the Society's "broadest, foulest blot," we are not, unless we improve, doomed to immortality, but to that oblivion in which lie the embers that were extinguished in ages past.

In a word, let us try and do something to enable us to pay our way.

GEORGE ANDERSON.

35A, Great George Street, Westminster, Feb. 22, 1878.

## Parliamentary Intelligence.

### HOUSE OF LORDS.

MONDAY, FEB. 18.

Petitions against the following Bills were presented:—Bedlington Local Board (Water), from John Clayton and others; Castleford Local Board, from (1) Undertakers of the Navigation of the Rivers Aire and Calder, (2\*) Consumers of Gas in Castleford and places adjacent, (3) Normanton Gas and Water Company, Limited, (4), William, John, and Benjamin Mitchell; South Staffordshire Water, from (1) Messrs. Bass and Co. and Messrs. Allsopp and Sons, (2) Rural Sanitary Authority for Tamworth Union; York United Gas, from (1) Owners and occupiers of property in Monkgate, &c., (2) William Dove and Henry John Ware, (3) Charles Crummack.

TUESDAY, FEB. 19.

The Chairman of Committees informed the House that the opposition to the Clitheroe Gas, Water, and Improvement Bill was withdrawn.

Petitions against the following Bills were presented:—South Staffordshire Water, from (1) London and North-Western Railway Company, (2) Midland Railway Company; Trowbridge Water, from (1) Duke of Somerset, (2) Earl Manners.

THURSDAY, FEB. 21.

GAS-WORKS CLAUSES BILL.—A Bill to consolidate, with amendments, in one Act the provisions of the Gas-Works Clauses Act, 1847, and the Gas-works Clauses Act, 1871, was presented by the Lord Chancellor, and read the first time.

Petitions against the following Bills were presented:—Burton-upon-Trent Commissioners, from (1) Midland Railway Company, (2) London and North-Western Railway Company; Lichfield Gas, from Mayor and Corporation of the City and County of the City of Lincoln; Trowbridge Water, from (1) Bradford Improvement Commissioners, (2) Inhabitant owners, &c., and ratepayers of the Town of Bradford, (3) Thomas B. Saunders, (4) W. H. Long, J. J. Bush, and J. Colledge.

FRIDAY, FEB. 22.

A petition against the Lichfield Gas Bill was presented from the London and North-Western Railway Company.

### HOUSE OF COMMONS.

MONDAY, FEB. 18.

Bills read a second time and committed:—Bournemouth Gas and Water; Drumecondra, Clonliffe, and Glasnevin Township; East Grinstead Gas and Water; Farnworth and Kearsley Gas; Hemel Hempstead District Gas; Shrewsbury Gas; Southport Water; Torquay Gas.

MANCHESTER CORPORATION WATER BILL.—On the motion of Mr. Selater-Booth, it was ordered that Dr. Lyon Playfair, Mr. Salt, Mr. Rodwell, Sir Ughtred Kay-Shuttleworth, and Mr. Knowles be members of the Select Committee on this Bill.

A petition against dispensing with Standing Order 129, in the case of the petition of the Corporation of Southport against the Southport Water Bill, was presented from Southport Water-Works Company.

\* This petition is also in favour of the Castleford and Whitwood Gas Bill.

Petitions against the West Houghton Local Board Bill were presented from (1) London and North-Western Railway Company, (2) Corporation of Manchester, (3) Charles Joseph Stonor and others.

The *locus standi* of Owners, &c., in Saltburn-by-the-Sea, as petitioners against the Marske and Saltburn Gas Bill, was disallowed.

TUESDAY, FEB. 19.

The following resolution was reported from the Standing Orders Committee:—"That, in the case of the Southport Water Bill, petition of the Corporation of Southport for dispensing with Standing Order 129, in the case of their petition against the Bill, the said Standing Order ought not to be dispensed with."

PUBLIC HEALTH ACT, 1875, AMENDMENT BILL.—On the motion of Mr. Alexander Brown, the Select Committee on this Bill were nominated as follows:—Sir Thomas Acland, Colonel Brise, Mr. Corbett, Mr. Cowen, Mr. Fremantle, Sir Harcourt Johnstone, Mr. Peel, Sir Baldwin Leighton, Mr. Paget, Mr. Pell, Mr. Ryder, Mr. Salt, Mr. Whitwell, Mr. Reginald Yorke, and Mr. Alexander Brown.

The petition of the Midland Railway Company against the Cheltenham Water Bill was withdrawn.

MANCHESTER CORPORATION WATER BILL.—The Committee of Selection added the following members to the Select Committee on this Bill:—Lord Eslington, Mr. Brassey, Sir John Lubbock, and Mr. Bruce.

THURSDAY, FEB. 21.

On the motion of Sir Charles Forster, the order for the second reading of the Dore Water Bill was discharged, and the Bill withdrawn.

The petition of Justices of the Peace for the County Palatine of Lancaster against the West Houghton Water Bill was withdrawn.

FRIDAY, FEB. 22.

Petitions against the Drumcondra, Clonliffe, and Glasnevin Township Bill were deposited, from (1) Corporation of Dublin, (2) Robert H. Sneyd, (3) Most Reverend Edward McCabe and others, (4) Ratepayers and others, (5) Alliance and Dublin Consumers Gas Company.

SATURDAY, FEB. 23.

The petitions were withdrawn of Millowners, &c., on River Worth, against the Bradford Water and Improvement Bill; and of Midland Railway Company, against the Cheltenham Corporation Water Bill.

## Legal Intelligence.

### SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

WESTMINSTER, WEDNESDAY, JAN. 30.

(Before Lords Justices BRAMWELL, BRETT, and COTTON.)

TURNER v. HEDNESFORD GAS COMPANY.

Mr. H. MATTHEWS, Q.C., who appeared for the defendants, the Hednesford Gas Company, of Hednesford, Staffordshire, said this was an appeal from an order of the Exchequer, directing a counter claim to be struck out. The Master originally ordered the counter claim to be struck out, and Justice Hawkins rescinded that order, while the Exchequer Division again restored it. The action was brought by Samuel Turner, a contractor, who had entered into an agreement, in July, 1877, to put up a tank for the Hednesford Gas Company. He commenced work in August, 1877, and in the same year he was stopped from proceeding, his tools and plant being taken possession of by the defendants. In defence the Gas Company alleged that it was expressly provided, in the agreement by which the tank was to have been made, that if the contractor failed to carry out the works, or the instructions of their engineer, the work should be taken out of his hands and completed by the Company. They alleged that the plaintiff failed to carry out the instructions, and they, therefore, took possession of the plant and materials, and continued the work; and they said that the costs they had incurred had exceeded what would have been due under the contract. Further, they said that they had a claim against the plaintiff for £250, the amount of the contract, and against the plaintiff's surety, Brown, for £200, the amount to which he had made himself liable. They had accordingly made these counter claims, and brought Brown into the case. Brown had procured the striking out of the counter claim by the Exchequer Division, and from that the Hednesford Gas Company now appealed. The learned counsel based his right to put in the counter claim on Order 22, Rule 5, under the Judicature Acts.

Mr. McINTYRE, Q.C., for Brown, contended that the counter claim was not maintainable against him.

Lord Justice BRAMWELL said the appeal must be allowed. It was a reasonable and right thing that when an action was brought against a man he should be at liberty to say, "I have not only a defence against your claim, but I have another claim against you in relation to the same matter." It was right and reasonable, further, that a counter claim should be allowed, with power to add, as defendants in the action, such persons as the claim was enforceable against, and, in his lordship's opinion, the case was provided for by the rules.

The other learned Judges concurred, and the decision of the Court below was reversed.

### WESTMINSTER GENERAL ASSESSMENT SESSIONS.

THURSDAY, FEB. 14.

(Before Mr. P. H. EDLIN, Q.C., Chairman; Mr. PENNYN, Admiral ROBERTSON, Sir W. H. WYATT, and Mr. GRIFFITHS.)

THE NEW RIVER COMPANY, Appellants, v. THE PARISH OF ST. MARY, ISLINGTON, Respondents.

This was an appeal by the Company against their assessment to the poor-rate in the parish of St. Mary, Islington.

Mr. WEBSTER, Q.C., and Mr. HARNSWORTH, appeared for the appellants; Mr. POLAND, Q.C., and Mr. TICKELL for the respondents.

On the part of the Assessment Committee of the Parish of St. Mary, Islington, it was stated that early in 1875, pursuant to the Valuation of Property (Metropolis) Act, 1869, the Overseers prepared the second quinquennial list, in which the land, reservoirs, mains, pipes, &c., occupied by the New River Company in the parish of Islington were assessed in one hereditament at £22,500 gross value, and £20,000 rateable value. In February, 1877, however, the Overseers ascertained that the hereditament occupied by the appellants within the parish had been added to and altered by the laying of additional mains and pipes, and by connecting these, and likewise their old mains and reservoirs, with a large number of new houses, and that by means of the new water-rents thus obtained the value of the hereditament had been considerably increased, and they increased the assessment to £23,250 gross and £20,700 net.

For the Company it was set forth that the valuation list for 1875 was binding on the Assessment Committee and the Overseers of the Parish for a term of five years from the date of the valuation list, as representing the true gross and rateable value of all the rateable property of the Company included in, and made the subject of, the valuation list for the year 1875. They further contended that the respondents were not entitled, by reason



that the appellants had, since the date of the valuation list for 1875, taken or occupied more land by mains and pipes, in order to increase the area supplied, to revalue the whole of the land occupied by the Company in the parish, but were only entitled, on any view of the case, to value and insert in the supplemental list the value of such land taken or occupied since such original list was made, and to add the value thereof to the values appearing in such original list. They stated that the gross value of £23,250 and the rateable value of £20,700 were greatly in excess of the true gross and rateable values of their property in the parish, and that the supplemental valuation list ought to be corrected by reducing the gross value from £23,250 to £22,612, and the rateable value from £20,700 to £20,100.

Mr. WEBSTER contended that the old mains were not removed, and that new pipes had been laid connecting them with new houses which had been built; that the value of them was fixed in the valuation list of 1875, and must remain the same for the ensuing five years. The same point had been already decided by this Court, and he strongly urged that the connecting of new pipes with old mains did not entitle the respondents to re-assess the old mains under the 47th section of the Metropolis Valuation Act.

Mr. POLAND, for the respondents, disbelieved that it was ever the intention of the Legislature that if new streets were formed, and the pipes of any water company were tapped for the supply of new houses, from which that water company obtained additional rates, that they should not be subject themselves to any increased rating for a period of five years. The old rates were made annually, as there might be a change in the circumstances to justify an increase in the rating, and to meet that, after the Valuation Act was passed, a clause was inserted in it to authorize the parishes to make a supplemental valuation list. If new houses were built, and those houses were connected with the mains of the Company, and no alteration was made from time to time, the effect would be that the New River Company would altogether escape for five years from the rating for these houses. In the parish of Islington, which was rather an outlying district, buildings were going on to an enormous extent, and as these additional houses were supplied with water, it justified the parish in raising the rating upon the New River Company to the extent of £700. This was a matter of very great importance, for they might, at the time of making the valuation list, have a number of streets laid out, and the houses would be speedily finished, and when supplied with water would increase the Company's receipts from £200 to £1000 in the five years, and yet they were told there was to be no increase in the rating of the Company's property. As the rating went on for five years, a clause providing for a supplemental valuation list was put in, for the very purpose of meeting such a case as this. The whole of the parish of Islington was supplied by the New River Company, the property and building operations in the parish had exceeded the rating between £30,000 and £40,000 a year, and yet for all this property, from which the Company derived great profits, they wished to escape for five years from being rated at all. When this increased supply to houses took place, he contended that the pipes of the Company became a new hereditament, and it was impossible that the Company could be treated more equitably than they were by the operation of the supplemental valuation list. If the Company were to be valued for five years, and the same tenants remained for the whole of those five years, then there would be no difficulty, but it was a very different thing when they considered the increased value of the Company's property when their pipes became connected with the houses in the new streets, after the making of the valuation list, and from which they derived large returns. As the list was settled for five years, and not, as now contended, altered from year to year, the New River Company escaped from the rates they ought to pay to the parish for the increased income they received, and he asked the Court to give judgment in favour of the respondents.

After a few words from Mr. WEBSTER, Mr. EDLIN said they were all agreed, and allowed the appeal; but, upon the application of Mr. POLAND, it was determined that a case should be stated for the decision of a superior Court on this point.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

BERMONDSEY VESTRY.—At the meeting on the 18th inst., a letter was read from the Lewisham District Board of Works, enclosing a resolution passed by them, stating that, in their opinion, if the Metropolitan Board of Works were able to purchase, at a reasonable cost, the interest of the Water Companies, it would be desirable; but as to the second scheme, to provide a new and independent supply, they were opposed to it, and requested this Vestry to oppose the same. Mr. Shepherd said he agreed with the resolution read, and stated that the National Chamber of Trade intended to oppose the attempt to provide a dual supply. He thought, however, it was very desirable that the Metropolitan Board should buy up the Companies. He moved that the Vestry approve of the action of the Chamber. Mr. Porter seconded the motion. Mr. Cyrus Legg, the representative of the Vestry at the Metropolitan Board of Works, said that his own opinion was that the Vestry need trouble themselves very little about either of the Bills. The condemnation of the attempt to provide the dual supply was so general, that there was no chance whatever of its passing. He did not think any good would arise from the purchase of the interests of the Water Companies, but would prefer that a good Regulation Bill should be passed. Mr. Holmes feared that no Regulation Bill, such as would meet the approval of Parliament, would prove of any advantage to the consumers. The motion was put and agreed to.

Major Bolton reports that the state of the water in the Thames and Lea was generally turbid and discoloured during the greater part of the month of January. The water in the River Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea and East London Companies are situated), was turbid from the 1st to the 8th of January, it improved in clearness on the 9th, and from that date it remained fairly good up to the 28th, after which it again became coloured, and remained in a turbid condition until the end of the month. The highest flood state of the river at Hampton during the month was 2 feet 3 inches above summer level, and the lowest reached the summer level.

LOOE GAS COMPANY.—At the annual meeting on the 15th of February, a dividend of 5 per cent. was declared, and a balance of profit carried forward amounting to £120.

EXPLOSION OF GAS AT ROCHESTER.—On the 11th inst., just before midnight, an explosion of gas occurred on the premises of Mr. Belding, oilman, King Street, Troytown, which resulted in the destruction by fire of no less than eight dwelling-houses, and the loss of two lives. It is alleged that, contrary to general belief previously, the water was turned off at the mains, and that to the delay in obtaining an adequate supply much of the damage is attributable.

IPSWICH GAS COMPANY.

The Annual Meeting of Shareholders was held on Monday, the 18th inst.—W. BUNN, Esq., in the chair.

The report of the Directors was as follows:—

The Directors have pleasure in presenting to the Shareholders a statement of the accounts for the year ending Dec. 31, 1877. The profit and loss account shows a balance available for the payment of dividend amounting to £8501 14s. 6d. The Directors, therefore, recommend that a dividend of 10 per cent. per annum be paid upon the original shares, and 7½ per cent. upon the new shares, and that the sum of £800 be carried to the reserve-fund, and the balance to the repair and maintenance account.

The works referred to in last year's report as being in progress are completed—viz., two additional purifiers and steam hoist, two of West's patent mechanical stoking apparatus, and a siding from the Quay railway on to the Company's premises. In consequence of the station-meter being too small to pass the present make of gas, the Directors propose to substitute for it a meter calculated to pass 60,000 cubic feet per hour. The offer of the small plot of land lying between the Cliff Road and the Company's premises having been made to the Company on advantageous terms, the Directors deem it desirable to purchase it as a site for a new gasholder, which will soon be required.

At a special meeting of Shareholders, held on the 8th of April last, it was resolved to create 1800 new shares of £10 each; 1755 of these shares have been allotted, and a call of £2 10s. per share paid thereon.

The Directors have announced a reduction in the price of gas to private consumers, from 3s. 9d. to 3s. 6d. per 1000 cubic feet, which reduction will take effect from the commencement of the year.

The Directors, with great regret, have to report that, since the last annual meeting of the Company, two of their number have been removed by death—viz., Robert Garrod, Esq., and Colonel Henry Phillips, both of whom took great interest in the undertaking. Thomas Clement Cobbold, Esq., M.P., has been appointed in the place of Mr. Garrod, and A. H. Bartlett, Esq., M.D., in the room of Colonel Henry Phillips.

The following Directors go out of office by rotation, but are eligible for re-election—viz., John Chevallier Cobbold, Esq., Thomas Clement Cobbold, Esq., M.P., and Alexander Henry Bartlett, Esq., M.D. Mr. John Roper Sheppard goes out of office, by rotation, as Auditor. In consequence of defective sight, he does not offer himself for re-election. Mr. Samuel Alexander Maw, jun., who has acted for him *pro tem.*, offers himself for the appointment.

Dr.—Capital Account, for the Year ended Dec. 31, 1877.

To Expenditure to Dec. 31, 1876	£70,218	9	11
Since that date—			
New buildings, manufacturing plant, machines, storeage works, and other structures connected with manufacture	2,147	0	11
New mains and service-pipes (not being in place of old ones), including laying same, paving, and other works connected with distribution	340	2	0
New meters (not in place of old ones), including fixing	129	11	6
Total expenditure	£72,835	4	4
Balance on capital account	7,524	4	11
	£80,359	9	3

Cr.—Capital Account.

By Ordinary shares of £10 each	£28,000	0	0
Ditto of £10 each	30,387	10	0
Mortgages and bonds	17,400	0	0
Premium-fund account	4,571	19	3
	£80,359	9	3

Dr.—Revenue Account.

To Manufacture of gas—			
Coals, including dues, carriage, unloading, and all expenses of depositing same on works	£10,337	10	0
Purifying materials, oil, water, and sundries at works	247	15	1
Salaries of Engineers, including Chief Engineer, Superintendents, and officers at works	834	4	6
Wages and gratuities at works	1,608	9	11
Repairs and maintenance of works and plant (including renewal of retorts), machines, apparatus, tools, materials, and labour	1,395	5	11
	£14,423	6	5
Less old material sold	26	2	11
	£14,397	3	6
Distribution of gas—			
Salaries of Surveyor, Chief Inspector, Inspectors, Assistant Inspectors, and Clerks in Light Office	136	6	8
Repair, maintenance, and renewal of mains and of service-pipes, including materials, laying and paving, and labour	119	3	0
Repairing, re-erecting, and refixing meters	497	15	0
Public lamps—			
Lighting and repairing	519	19	3
Rents, rates, and taxes—			
Rates and taxes	701	9	7
Management—			
Directors' allowances	300	0	0
Salaries of Secretary, Accountant, and Clerks, Office-keepers, and Messengers	266	13	4
Collectors' commission or salaries	150	0	0
Stationery and printing	84	5	4
General establishment charges and incidentals	72	16	0
Auditors	21	0	0
Law and parliamentary charges—			
Law	16	15	7
Bad debts	319	14	1
Suspense account	169	16	4
Total expenditure	£17,772	17	8
Balance carried to profit and loss account	7,374	1	10
	£25,346	19	6

Cr.—Revenue Account.

By Sale of gas—			
Private light rental	£16,578	11	7
Public lighting and under contracts	1,924	11	4
Rental of meters	528	3	7
Residual products—			
Coke, less labour and cartage	4,356	7	0
Breeze, ditto	152	11	2
Tar, ditto	1,099	9	11
Ammoniacal sulphate	552	13	7
Rents	108	0	0
Fittings	46	11	4
	£25,346	19	6

The CHAIRMAN moved the adoption of the report, saying that he had nothing further to do than to congratulate the Proprietors upon the prosperity of the concern. It would be seen from the accounts that they were progressing very satisfactorily, and they had every prospect of continuing to do so. It was with great pleasure that the Directors were able to make the announcement that from last Christmas the price of gas would be reduced from 3s. 9d. to 3s. 6d.

Mr. WESTHROP seconded the motion.

Mr. S. A. MAW said he believed they had been doing a very good business during the year, and that there was much reason for congratulating themselves, though perhaps others subjected them to a little criticism. They had very excellent works, and during the last few years had greatly improved their power of producing gas, and he believed they really did serve the good old town of Ipswich well, although some were ready to call in question their management of the works. The works were certainly in a



much better position than they were a few years ago. A new retort-house had been built, and the old retort-house being in a very bad state of repair, it was thought right that a considerable portion of the surplus earnings of last year should be set aside to pay for its repair, which almost amounted to rebuilding. On the whole the Company were in a very sound and satisfactory condition. He wished he could see the inhabitants of the town a little more willing to be pleased than they seemed to be. Whether they were or not, the Directors of the Gas Company must endeavour to do their duty, as he believed they had to a large extent hitherto done. He did not say that absolute perfection was attained, but it was to a large extent, and that at a moderate cost, the price of gas at Ipswich being almost the lowest, if not the very lowest, in the eastern counties. The Company had no control over those who directed that such small burners should be used in the public lamps, and who, in many cases, had them placed at the maximum distance from each other. The burners were certainly too small to show off the gas to advantage, and though the town might be said to be fairly lighted, he did not think it well lighted for that reason.

The CHAIRMAN said returns had been obtained of the price of gas in all the other towns in East Anglia with which Ipswich might be compared, and they were as follows:—At Ipswich the price was 8s. 6d.; Colchester, 4s. 9d.; Cambridge, 4s.; Norwich, 4s.; Yarmouth, 3s. 9d.; Lowestoft, 4s. 9d.; Bury St. Edmund's, 4s. 7d.; Lynn, 4s.; so that there was no town in the district in which a higher price was not charged.

Mr. G. S. CLARKE observed that, whilst the rental of meters was £528, the cost of repairing, renewing, and re-fixing meters was £497, so that they did not seem to be doing a very profitable trade in letting meters.

Mr. E. GODDARD, the Manager, said the meters throughout the town had been examined, and a large number removed and new ones substituted, and this made the cost exceptionally great.

The motion was unanimously agreed to.

It was resolved that dividends of 10 per cent. on the old, and 7½ per cent. on the new shares be paid.

The retiring Directors were re-elected, and all expressed their thanks to the Shareholders for their confidence in them. Mr. Maw was elected Auditor in the room of Mr. J. R. Sheppard, and votes of thanks to the Chairman and to Mr. Goddard closed the proceedings.

#### POOLE GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday, the 11th inst.—Mr. W. PEARCE in the chair.

The Directors report was as follows:—

The Directors feel much satisfaction in being able to lay before the Shareholders a more favourable report as to their operations for the last half year than they have been able to do for some time past.

During this last half year they have borrowed a further sum of £900 by the issue of nine debenture bonds at £100, which will complete the £5000 they were authorized to borrow by the resolution of the General Meeting on Aug. 14, 1876.

At the close of last half year there was a balance of capital in hand amounting to £370 4s. 6d.; this, with a small sum out of the £900, has been expended during the last half year in purchasing some further land adjoining the works, and laying down some additional mains, and there now remains in hand on capital account a balance of £223 4s. 10d., which the further improvements on the works now in hand will very nearly exhaust.

The Directors in their last report called the attention of the Shareholders to the very large quantity of "unaccounted for gas," which for the half year had averaged 33 per cent. on the quantity made, and at the same time stated that they had ordered a thorough examination of all the underground work, and hoped, by having this done carefully and systematically throughout the whole town, to effect some very great improvement before they met the Shareholders again, and they have now to add that, although the work has not yet been completed, it has already effected, as they expected it would, a very great improvement. Less coal has been used in the last than in the preceding half year, and less gas made, although there has been a much larger quantity sold, and the loss has been reduced from 34½ to 16½ per cent.; this the Directors consider satisfactory, as far as it goes, but they hope by the time the work is completed to have done something better than this.

The Directors, with their Manager, have, during the last half year, been directing their especial attention to the manufacturing department, and the result has been a larger quantity of gas and greater weight of coke per ton of coals than they have ever been able to get continuously for any length of time before, and they see no reason why these improved results should not be kept up continuously.

In the revenue account there are two special items on the creditor side, which appear to increase the profits unduly, but there are also some extra charges on the debtor side for the examination and repair of the underground works, of about the same amount, and the two nearly balance each other.

These things combined have produced for the last half year some greatly improved results, the profit for the half year being £719 11s., as against £437 15s. 10d. for the preceding half year.

The Directors think that there is no reason to fear that this amount of profit will fall off, but, on the contrary, that if a close supervision is kept over the expenditure, the Shareholders may expect that this profit will increase in due proportion with the increase of business; and, without being too sanguine, that in the next half year, or the half year following, the profit will be sufficient in itself to pay the maximum dividend.

The Directors wish they could add to this so far favourable report, that the profit had, on the present occasion, been of itself sufficient to pay the half year's maximum dividend and the interest upon debentures; but although it is very nearly sufficient, it is not quite so, being less by £31 9s., which amount the Directors propose, with the sanction of the Proprietors, to take from the reserve-fund, and so pay the full dividend as heretofore.

The reserve-fund at the close of the last half year amounted to £392 14s. 5d., and if from this we take the £34 9s., as proposed, there will remain a balance of £358 5s. 5d.

The CHAIRMAN, in moving the adoption of the report, congratulated the Shareholders on the improved state of their affairs. He trusted that within a few years time the gas-works at Poole would be as good as any in the kingdom. When he undertook the office of Chairman, about two years ago, there were troubles and difficulties in all directions, which he thought were now pretty nearly overcome; and so long as they could make good gas at a moderate price, and pay the full amount of dividend, he thought they need not trouble about what he was going to call their old enemy, the Town Council, as to lighting the public lamps, although, as ratepayers and gas consumers, they were seriously injured. He would now speak of the works the Company had in hand (which formed a large item in the accounts), and the improvements they were about to undertake. The mains throughout the greater part of the town had been relaid with pipes of larger diameter, the old mains and services repaired, and Messrs. Bayley's work made right and tight, and the leaks stopped. This had already nearly paid for the outlay by saving 15 per cent. extra of the gas made, amounting to about £500 per year. The next extension would be the erection of a steam-engine and exhauster, which would be commenced next month, and they calculated a saving of 500 feet of gas from every ton of coal. The Works Committee had also approved and recommended the Directors to adopt a plan for utilizing the ammoniacal liquor, which would give them a further profit of £150 per year, as there was a ready sale for the sulphate of ammonia at a good price—£21 per ton. These works would exhaust the whole of their capital, but they required a new coal-store, a board-room, and other offices, which must be deferred for the present.

The motion was seconded; and, after some conversation, was put and agreed to. The dividends recommended in the report were declared, and the retiring Directors and Auditor re-elected.

The proceedings terminated with a vote of thanks to the Chairman and Directors.

SLEAFORD GAS COMPANY.—At the annual meeting of this Company, a dividend of 6 per cent., free of income-tax, was declared.

#### CORK GAS CONSUMERS COMPANY.

The Half-Yearly Meeting was held on the 11th inst.—Mr. T. MAHONEY in the chair.

The SECRETARY (Mr. Denny Lane) read the following report of the Directors:—

Gentlemen,—You will find annexed the accounts of the Company for the half year ending December, 1877. There appears a small increase in the private rental. The amount received for public lamps is somewhat less, but that is caused not by decrease in consumption, but by a reduction in price to the Corporation, which has been in operation for the past year.

In consequence of the rate of freight from the North of England having been exceptionally low, we have been able to get in our stock of coal on very favourable terms, while our residual products have yielded us a good return.

We have, as you are aware, reduced the price of gas for the current year. From this change the public will derive a benefit of nearly £2000 annually. We hope that this reduction in your income will, to some extent, be recouped by a larger consumption; and with this view we are about to take steps to induce the public to use gas more generally for cooking and heating purposes. Our resident Engineer, Mr. Travers, has just brought out a small pamphlet on the subject, in which the economy, efficiency, and convenience of gas for such purposes is clearly pointed out, and to which we wish to direct your attention.

We have placed £500 to the credit of depreciation-fund; and, in accordance with the provisions of the Gas-Works Clauses Act, we have invested £1475 in Railway and Harbour Board Debentures.

The balance of profit and loss account amounts to £7670 8s. 10d., out of which we recommend that the ordinary dividend, at the rate of 8 per cent., be paid. This will amount to £5237. We also recommend that 1 per cent. additional be declared on the capital paid up to Dec., 1873, being the amount which the dividend paid for that half year fell short of the ordinary rate. This will absorb £1243 in addition; and, with your sanction, we propose to add the residue of £1190 to the reserve, which will bring that fund up to £8293, or less than half the sum to which it is limited by the Legislature.

#### Resident Engineer's Report to the Directors.

Gentlemen,—I have to report that the supply of gas during the past winter has been ample for the requirements of the city; and that, in case of any extra demand having arisen, or any accident having taken place, I had under my hand a reserve of retorts sufficient to provide for such contingencies.

The reconstruction of the first bench of retorts and chimney built by the Company has progressed satisfactorily, and will be soon completed. The large station-meter, at the new works, has been erected, and will be fit for use next winter.

On the works it will be necessary to lay some mains, and to enlarge some others; but the expenditure under this head will not be large.

The excavation for underground tar-tank has been completed, and the tank will be fixed during the summer.

The amount received for residual products will, I trust, prove satisfactory to the Proprietors.

(Signed) THOMAS TRAVERS.

The SECRETARY also read the following report by the Consulting Engineer:—

My last inspection of the works was in November. At that time you were in good trim for the winter's work, with a large reserve of producing power, which, according to Mr. Travers's report to me, no accident occurred to require the aid of. The unaccounted-for gas Mr. Travers informs me of, and from his figures it has been considerably reduced. I would, however, advise that the asphalt of the service-pipes be continued until every service-pipe in the city has been covered—not merely for the reduction of present leakage, but for the prevention of future waste, as well as for the preservation of the pipes. I understand that about the Lower Glanmire Road and Montenotte some enlargement of the main-pipes will be desirable this summer. I will inquire into this on my first visit this spring. Iron is now very cheap, and pipes for the work will be got at three-fourths of the price they would have cost a year or two ago. From the statements of the half year's working, furnished me by Mr. Lane, I am admonished to cut this report short. They tell a tale of success which the Shareholders will understand. I know of nothing that can interfere with a steady, continuous prosperity, so long as that unity of action exists which has hitherto prevailed. I think it would be a good expenditure of money to present each Shareholder with a copy of Mr. Travers's excellent brochure on the uses of gas, for, with gas so cheap as you sell it in Cork, it can favourably compete with coal for many domestic purposes.

(Signed) GEORGE ANDERSON.

Dr.	Capital Account, Dec. 31, 1877.		Cr.
Share capital of the Company	£150,000 0 0	Amount paid on shares	£134,730 0 0
Debenture capital of the Company	19,800 0 0	Ditto debentures	19,800 0 0
		Uncalled capital and shares not registered	14,397 0 0
		Due by Shareholders on registered shares	873 0 0
	£169,800 0 0		£169,800 0 0
Revenue Account.			
Coals	£7,446 17 4	Rental—	
Labour	2,602 0 6	September quarter	£4,760 2 7
Wear and tear	2,034 5 7	December ditto	12,118 13 9
Purifying materials	260 4 10	Public lighting—	
Water and gas at works	113 11 6	September quarter	737 5 5
Public lighting	252 7 10	December ditto	1,343 13 8
Salaries	915 0 0	Residuals	5,252 19 4
Rents	122 1 10	Transfer fees	4 18 0
Rates	861 18 1		
Advertising and stationery	51 4 10		
Office expenses	143 14 5		
House and office repairs	15 7 2		
Auditors	20 0 0		
Directors	175 0 0		
Profit and loss	9,203 18 10		
	£24,217 12 9		£24,217 12 9

The CHAIRMAN, in moving the adoption of the report, said the only item he had to call attention to, or remark upon, was that most unsatisfactory one connected with the late Accountant. There was no alternative as regarded that matter, nor could they say yet when they would have any further information to give the Shareholders. The Directors had been urging their Solicitor to make all possible exertion, and he was, it appeared, pressing the matter forward as well as he could. Unless it was brought under the notice of Parliament, however, he did not see much chance of their getting back the money. At present it would be useless for them to introduce such a subject to the notice of Parliament; there were so many questions engaging the attention of the Legislature, they would kick them out of doors. In answer to inquiries, the Chairman said all the money that Collins took at the time was recovered, but the money spent upon the prosecution, and getting witnesses over from foreign countries, he thought they might fairly be repaid by the Government, inasmuch as if they did not conduct that prosecution, the Government would have had to do so. The Directors intended, if they could do so with any chance of success, to have it brought under the attention of Parliament at a later period of the session. Referring more immediately to the working of the Company, he said that during the past year they never had so few complaints from private consumers. They had done well for their customers, and they had attended to their complaints as quickly as they were received. They did not appear, however, to have given universal satisfaction to all their customers, for they were astonished to receive from the Town Clerk a letter bringing a bill of indictment of a very serious nature against them, and threatening them with all manner of pains and penalties. When they saw the indictment, such as it was, they took instant action in the matter, and their Secretary waited on the Corporation officers with a view to obtaining particulars of what they complained of. He (the Chairman) held in his hand a book usually kept in the Corporation offices, and which contained the complaints of the Corporation lamplighters for half the week. At the end of each half week this book was handed to the officers



of the Gas Company, and another substituted, which, in its turn, contained a record of any damage done to lamps, or any defects reported by the lamplighters. The letter of the Town Clerk stated that the reports were invariably not attended to, and when that complaint was laid before them, they thought there really was something very much astray, and their three leading officers waited on the officers of the Corporation, and asked them to point out the cases that were unattended to. He might tell them that they found in one day there were 79 complaints made by the lamplighters, and in three consecutive days they had no less than 150 complaints made. Their officers asked the officers of the Corporation to point out in their own book any cases in which their complaints had not been attended to. They went over the books, and the result of the examination was that the entire number of complaints which appeared to be unattended to was only 22. This was submitted to Mr. Lane, who re-examined the books, and found that out of the 22 cases alleged to be not attended to, 14 were shown by their own book to have been attended to, two were not entered at all, and the remaining six might have been attended to, although there was no record of the fact. So that, of their complaints, numbering some thousands, not one in a thousand could be shown to have been neglected. But their astonishment was still further increased by the fact that one gentleman had the courage to state before the Corporation that Mr. Lane's letter to the Town Clerk was an evasive answer to the complaints made, and not satisfactory at all. When they read that below stairs, the Secretary said it reminded him of an old country gentleman who lived in the west of Galway, at a time when book-keeping was badly understood and cash-keeping not at all. He was leading a secluded life, apart from the friends who were anxiously inquiring for him. One day a knock came at the door, and the servant man went out to answer it. When he came back, the master asked him who it was, and was told it was one of his creditors. "What answer did you give him?" said he. "Oh," said the servant, "I gave him an evasive answer." "What was that?" said the other. "Why," said he, "I told him that, if he didn't lave that I'd break every bone in his body." He believed that Mr. Lane's reply to the Corporation was just about as evasive as that he had mentioned. As to another matter, he should say that they would not have so large a rental this year as the one previous, as they had reduced the price of gas. Unless there was an increased consumption there would be a decrease of about £2000 in their revenue. They hoped, however, that this increased consumption would take place through the use of gas-stoves and heating and cooking apparatuses. In a few days an establishment would be opened in the city where the apparatus could be seen working. There was one item in the account which he considered most satisfactory, and that was regarding the investments in debentures. There was a sum of £7000 invested in different matters outside their own business—they were obliged to invest their profits outside their own trade—and this investment was considered most satisfactory.

Alderman KELLER said that he was on the Gas Committee of the Corporation, and he thought they were not to blame. The servants of the Corporation were paid for reporting those matters, and it was no blame if the complaints were forwarded.

The CHAIRMAN: But what we complain of is that Mr. Lane's letter should have been so heroically termed an evasive reply.

Mr. HARRINGTON said it was scandalous to see the number of lamps that were wilfully broken through the city, at a great expense to the Company.

Alderman KELLER remarked that the Corporation had offered a reward for the conviction of any person found breaking the lamps.

Mr. N. MAHONY thought the Town Clerk should withdraw the statements made in his letter, as he was not able to substantiate them.

Mr. LANE said that occasionally cases of complaint might occur from causes beyond their reach. He believed there was a desire on the part of the officers of the Corporation to accommodate the Company's officials, and this desire was very often the cause of delay. Of course it would be impossible for the Company's staff of workmen to attend to eighty cases in one day; but no delay of longer than a day ever occurred.

The motion was then put and carried, and a dividend of 8 per cent. declared, with 1 per cent. additional on the capital paid up in December, 1873, as being the amount which the dividend for that half year fell short of the ordinary rate.

A vote of thanks was passed to the Chairman, and the proceedings terminated.

#### LIVERPOOL UNITED GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Tuesday, the 19th inst.—Mr. J. A. TINNE (the Chairman) presiding. The following report was submitted:—

The Directors have caused to be prepared and submitted to them an estimate of the profits of the Company for the half year ending Dec. 31 last, in accordance with the Company's Acts of Parliament, and having duly considered the same, recommend the Proprietors to declare a dividend, for the half year ending as above stated, of £5 on every £100 of the ordinary consolidated stock, and at the rate of £3 10s. for every £100 of the consolidated B (7 per cent.) stock, and on the capital paid up in respect of the new £7 10s. shares.

The necessity of providing for payment of the Dock Board's claim in respect of the accidental burning of the landing-stage has, for the past two years, prevented the Directors from reducing the price of gas so much as otherwise would have been practicable. Although considerable reductions have, notwithstanding, been effected, the Directors have the pleasure to announce that they now feel justified in still further reducing the price, from the 1st day of January last, to 3s. 6d. per 1000 cubic feet.

The CHAIRMAN, in moving the adoption of the report, said it would be, no doubt, satisfactory to the meeting, and, as he hoped, to the public also, that they were enabled to reduce the price of gas 3d. per 1000 feet, as announced in the report. He had nothing to add to what had been stated in the report.

Mr. JAMES LISTER seconded the motion, which was unanimously carried. The CHAIRMAN then moved the payment of the usual dividend, as recommended in the report.

Mr. D. O. BATESON seconded the motion, which was adopted. Upon the motion of Mr. J. R. DARSIE, a vote of thanks was accorded to the Chairman and Directors.

The CHAIRMAN, in acknowledging the compliment, said that the expression of confidence from the meeting was received with the more pleasure because the labours of the Board were not always unattended with considerable anxiety.

#### NEWPORT (MON.) GAS COMPANY.

The Half-Yearly Meeting was held on the 18th inst.—Mr. GRATREX in the chair. The following report of the Directors was presented:—

The accounts, as audited, for the half year ending Dec. 31, 1877, are forwarded herewith. The balance of the half year's profits being £2225 13s. 11d., the Directors recommend the usual dividends on the A and B stocks and class C shares, which will take £2138 14s. 10d., leaving a balance of £86 9s. 1d. to carry forward.

During the past half year new and extended sidings have been placed on the land acquired from the Monmouthshire Railway Company, thereby giving greater facilities for the increasing business of the Company. A railway weighing machine is ordered, and will be erected during the coming half year, so that in future all traffic coming to and going from the works will be weighed. It is also decided to erect coal-sheds, from which considerable advantages will arise in the manufacture of gas. Thirty additional

retorts have been erected in the new retort-house, thereby enabling the Company to meet in this department the increasing make of gas.

The Engineer reports that the whole of the works of the Company are in good and satisfactory order.

The CHAIRMAN moved that the report be adopted. The balance carried forward was smaller than usual; but the Engineer told them that the works were in good condition, and he thought there was a bright future before them. The object of the Directors was to keep down the expenses, and get as many customers as possible.

Mr. NEWMAN seconded the motion, which was adopted.

The CHAIRMAN moved the usual dividends—viz., 5 per cent. on class A, 3½ on class B, and 3½ on class C.

Mr. E. J. PHILLIPS seconded the motion, and said there was an increased consumption by new customers. The reports made by the Gas Examiner were such as to show that the Company made a good article, but at an increased cost of cannel coal and the mode of purifying. To this he attributed the smallness of the balance carried forward.

The motion was adopted.

A vote of thanks to the Chairman and Directors brought the proceedings to a close.

#### SCARBOROUGH WATER COMPANY.

The Half-Yearly Meeting was held on Monday, the 18th inst.—Mr. JOHN WOODALL in the chair. The report stated that—

A further sum of £649 17s. has been expended on capital account, and that the whole share capital of the Company has been called up and paid, with the exception of £531, leaving a balance at the bank in favour of the Company of £2798 3s. 8d.

In the revenue account, the most satisfactory result is that, after paying the extra £300 voted for the Chairman's testimonial, and £50 for the Manager's extra salary, there remains an increase of £287 9s. 10d. as compared with last year.

The Shareholders will remember that, on Oct. 9 last, they sanctioned a scheme for obtaining a large increase of water from the Moor above Harwood Dale. To effect this object, a Bill was prepared, and is now before Parliament. The Corporation soon afterwards obtained permission of the ratepayers of the borough to oppose this Bill, and obtain compulsory powers for the purchase of the Company's entire property, and the Directors were invited to meet the Mayor and a deputation of the Council at a conference on the subject, which, after much discussion, resulted in an agreement which will be submitted to the Shareholders. The terms mutually agreed upon secured to the Shareholders a perpetual annuity, equal to the full maximum dividend allowed by the existing Acts of Parliament, with the additional security of the rates of the town.

The Directors recommend that a dividend at the rate of 9 per cent. on the old, and 7½ per cent. on the new shares be declared and paid, free from income-tax, on the 1st of March next, after which a balance of £1789 will remain to the credit of next year's account.

On the motion of the CHAIRMAN, the report was unanimously adopted, and the dividend declared accordingly. The retiring Directors and Auditor were re-elected.

The meeting was then made special, and a preliminary agreement entered into by the Directors and a deputation of the Town Council was unanimously approved. It stipulated that the consideration for the purchase of the whole undertaking of the Company, from Jan. 1, 1878, should be "the issue and payment by the Corporation to the Directors of the Company of perpetual annuities equal to the full amount of the maximum dividend authorized by the Company's Acts of Parliament, to be paid on all the authorized share capital of the Company; and the Corporation should also be liable to, and shall pay and discharge, all the debts and liabilities of the Company on the 1st of January."

#### YORK NEW WATER-WORKS COMPANY.

The Half-Yearly Meeting was held on the 7th inst.—Mr. J. F. TAYLOR in the chair.

The SOLICITOR (Mr. J. P. Wood) read the following report of the Directors:—

A statement of accounts for the past half year is sent herewith, and the Shareholders will be glad to observe the important increase which has taken place in the revenue of the Company.

The new works at Accomb Landing are progressing favourably, and to the satisfaction of the Directors.

The Directors recommend that a dividend of 8s. per share on the ordinary shares, being at the rate of 8 per cent. per annum, and that a dividend of 3s. 6d. per share on the preference shares, being at the rate of 5 per cent. per annum, for the past half year, be declared, and that the same respectively be paid, without deduction for income-tax.

The Shareholders will be asked, at the special meeting to be held immediately after the ordinary meeting, to authorize the creation of 2000 new shares of £10 each, such shares to be entitled, until Jan. 1, 1888, to a fixed dividend of 5 per cent. per annum, and after that date to rank *pari passu* with the old ordinary share capital up to 7 per cent. dividend, which is the maximum allowed for capital created under the Company's Act of 1876. And they will also be asked to give the Directors power to raise, under the borrowing powers of the said Act, £5000 on mortgage or debenture, to enable them to pay off the balance of the mortgage existing on the old works, and for the other purposes of the Company.

Mr. Francis Taylor having resigned his office as Treasurer of this Company, the Directors have to report that they have appointed Mr. Arthur William North, the present Manager of the York Union Banking Company, Treasurer of this Company, in his place. The Directors much regret to have to report the death of Mr. Wm. Sotheran, for many years a Director of the Company; they have elected in his place Mr. John Brown, of High Ousegate, in this city, chemist and druggist. The following Directors—viz., Mr. James Lancelot Foster, Mr. Robert Varvill, and Mr. John Smith, retire by rotation, and are eligible for re-election. The retiring Auditor is Mr. Henry Sotheran, who is also eligible for re-election. In consequence of the vacancy in the office of one of the Auditors, by the resignation of Mr. John Brown, another Auditor will have to be elected, and the Directors beg to suggest Mr. Richard Henry Felton, of The Limes, Heworth Green, York, as a suitable person to fill that office.

The Engineers of the Company, Messrs. T. and C. Hawksley, made the following report:—

30, Great George Street, Westminster, S.W., Jan. 24, 1878.

To the Directors of the York New Water-Works Company.

Gentlemen,—We have the honour to report that the brickwork of the foundations of the new engine-house at Accomb Landing has now been carried up to the level of the pump floor. The progress of the buildings has been much delayed by the difficulties with which the Contractor has had to contend in making the excavations for the foundations; these have, however, been successfully surmounted, and there is now nothing to prevent the work from being carried on with vigour during the approaching spring. The pure water-tank has been nearly completed, and the embankments have been practically finished for some months past, and have effectually excluded the flood waters from the site of the new works.

(Signed) T. AND C. HAWKSELEY.

The CHAIRMAN moved the adoption of the report, and congratulated the Shareholders upon the report, which was one in every respect satisfactory. Their income was gradually increasing, and every day the city's requirements called for a larger supply of water. The accounts for the past half year showed that their revenue for water-rents was £6111, and he would mention that the supply of water sent daily into York averaged 1,720,000 gallons. The new main they found to be still satisfactory. Indeed, the pressure in the city was everywhere satisfactory. Adverting to the resignation of their Treasurer (Mr. Francis Taylor), the Chairman said that Mr. Taylor had deservedly won the esteem of all who knew him in the city.

Mr. J. L. FOSTER seconded the motion.

Mr. W. C. ANDERSON expressed a hope that the Directors would not be induced to increase the dividend until the capital account was closed and there was a good reserve fund.

The CHAIRMAN said the Shareholders might take it for granted that there



would be no increase of dividend until it was justly earned, and until it could be safely paid.

The motion having been carried, the dividends recommended in the report were declared, and the retiring Directors and Auditor were re-elected. Mr. Feltoe was elected an Auditor in the place of Mr. Brown, resigned.

Mr. RYMER then moved that, in consideration of the successful efforts of the Board in connection with the late Bill, the increased labour it entailed on them in carrying out its provisions, and the general good and prosperous management of the affairs of the Company, the allowance to the Directors be, from the 1st of January last, increased to £450 per annum.

Mr. FELTOE seconded the motion, which was cordially adopted, and the Chairman acknowledged the same.

The meeting was then made special, for the purpose of creating £20,000 of new shares, as recommended in the report, and the CHAIRMAN moved a resolution in formal terms. He remarked, in doing so, that the Shareholders had expressed an opinion in favour of the creation of ordinary rather than preference stock, and in that opinion the Board coincided. Consequently, this £20,000 of new capital would be ordinary stock; and so that the dividend upon the old capital should not be endangered, the new would remain at 5 per cent. for 10 years. Perhaps they might desire to know what they had done with the £20,000 they raised first. Well, they had paid for the land £3000, the laying of the new main was £4000, then there were the preliminary expenses and the Engineers charges, &c., in connection with the Bill, amounting to £1500 or £2000. This made a great hole in the £20,000. He hoped the new capital would not be required so rapidly, but they would have to deal with the Contractors, and it was very likely that the first call would be on the 1st of April, and another on the 1st of July.

After one or two questions had been asked, the resolution was agreed to, and the meeting terminated with a vote of thanks to the Directors.

#### CITY OF POTSDAM WATER-WORKS COMPANY, LIMITED.

The Third Annual Ordinary General Meeting of Shareholders was held at the London Offices of the Company, 7, Queen Victoria Street, on Wednesday, the 13th inst.—FRANCIS BENNOCH, Esq., in the chair.

The SECRETARY (Mr. H. R. Duke) read the notice convening the meeting, and the following report was presented:—

The Shareholders are called together, in conformity with the resolution adopted in August last, that future annual general meetings be held early in the month of February in each year.

As regards the condition of the works, a certificate has been given by the Company's Chief Engineer, to the effect that Mr. Arthur Jung's contract for their construction was duly completed to his satisfaction on the 1st of July last. This was followed on the 3rd of September by a declaration of the Potsdam Authorities that the Company had fully complied with the obligation imposed on them by the concession to construct water-works for the city, and that the article delivered was a pure, good water, well adapted for cooking, drinking, and domestic purposes.

The Magistracy have, however, thought fit to demand from the Company a penalty of 15,000 marks (say £750) for an alleged delay of ten weeks in the final completion of the works. The Board deny the Company's liability to any such fine, and an eminent lawyer in Berlin has been instructed to take what steps may be necessary to protect the Company's interests. The Directors regret that any disagreement should have arisen; they are, however, advised that their position is unassailable, and are prepared to resort with confidence to arbitration if the matter is further pressed.

The action of the Magistracy, coupled with groundless imputations by interested parties as to the quality of the water, which were finally set at rest by a most favourable report from an analyst of the highest standing, has seriously impeded the expected increase in the number of customers. Some large consumers have, however, recently joined, and others have arranged to connect with the Company's mains in the spring of the year, at which season it is confidently anticipated that a large number of contracts will be concluded with persons who have hitherto held aloof, owing to the circumstances before stated.

The Contractor's liability to pay interest on shares having ceased on the 31st of December last, future returns to the Proprietors will, of course, be dependent on the earnings of the Company.

A statement of capital, revenue, and profit and loss accounts to Dec. 31, 1872, is appended. As stipulated at last meeting, the revenue account was commenced on July 1, 1872, and although (after fully charging this account with all proper outgoings for the half year) a loss of £1372 14s. 10d. has been incurred, this should not, in the Directors' opinion, be deemed discouraging, being the result of the first six months working under all the disadvantageous circumstances and prejudice before referred to; and inasmuch as the expenses and charges will be but slightly increased as the business and income of the Company are extended, the Board are sanguine of being able to submit a greatly improved statement as the result of the present year's working. It should be noted, that although the full amount of Directors' remuneration (as allowed by the Articles of Association) has been charged against revenue account, the Directors have drawn but one-half of that sum, and will take the remaining moiety in shares, until such period as the position of the Company will admit of the full authorized sum being paid in cash.

Two of the Directors, Sir Stephen Walcott, K.C.M.G., and Mr. Abraham Scott, retire from the Board at this meeting, but are eligible for re-election, and offer themselves accordingly.

The late Secretary (Mr. O'Halloran) having resigned, and the office of Secretary and Accountant having been accepted by Mr. H. R. Duke, it becomes necessary to appoint an Auditor for the current year. Mr. Frederick Latreille, of 5, Bloomsbury place, W.C., has offered his services, and his election to the vacancy is recommended.

With the view of placing the financial affairs of the Company on a sound and satisfactory basis, the Board have decided to make a further issue of debentures, not exceeding £5000, which will be offered to existing Shareholders *pro rata* with their holdings.

The following is a translation of the intimation to the public by the Magistracy of Potsdam, as to the completion of the Company's works:—

We hereby notify to the public that the Water-Works Company here have completely complied with the obligations contracted for with this city, to establish a water supply for Potsdam and suburbs; and, particularly, that the water delivered by the Company is a clean, good water, well suited for drinking, cooking, and domestic purposes.

In gladly giving this acknowledgment in concert with the Common Council, we desire all inhabitants of the city to forward, as much as possible, the interests of the works, which have been erected and completed by the Company under difficult circumstances of times. The general advantage to the house and public service is unquestionable, and the blessings have been already proved in our city in many directions. The greater the number of consumers, the greater the chance of a superior quality of water to each. Any complaints in regard to the management of the water-works we request will be communicated to us.

THE MAGISTRACY.

Potsdam, Sept. 3, 1872.

The CHAIRMAN, in moving the adoption of the report, said that one of the matters to which he had to refer was the delay that had occurred in the completion of the works. That delay, as was fully explained at the last meeting, arose from causes over which the board had no control. A discussion had, however, arisen at Potsdam as to the facts of the case, and penalties had been demanded by the Magistracy. The Directors had, therefore, appealed to the arbitration clause in their contract; but, although this was done some months ago, no action had hitherto been taken thereon on the other side. Another point to be mentioned was the quality of the Company's water. The most distinguished chemist in Germany had pronounced it as excellent for every purpose for which it could be required, but a native analyst had described it as exceedingly obnoxious. It was quite clear that the Company had carried out everything that could be required of them, and it was the earnest desire and aim of the Directors that no fault should be found, either with the quality of the water or the manner in which it was supplied. He could fairly assert that no substantial complaint had been received from any consumer. Whether the authorities desired to obtain the control of the works of the Company he

was not prepared to say, but if they were, the Directors were quite ready to receive overtures from them. The works had been gradually extending, and the number of consumers had increased weekly since the opening; but in water supply as in gas, a considerable outlay had to be made at the outset, and it required some little time to elapse before the organization was perfected, and satisfactory returns could be realized. It was not immediately that people were aroused to the advantage of the supply which was offered to them, and until that was the case the business of the Company could not be fully developed. There could be no doubt, on the authority of the most eminent sanitary authorities who had been consulted with regard to the health of Potsdam, that its most urgent necessity was a plentiful supply of good water. To past deficiencies in this respect the high death-rate prevailing there might, in large part, be traceable. It was pleasing, therefore, to learn from their Manager that, in his opinion, although the Company had only been supplying water for about six months, it was probable that, within another year, the revenue derived from the business would cover the whole of the expenses—a fact which, perhaps, was unparalleled in the history of water-works undertakings. The capital outlay of this Company contrasted favourably with that of some others on the Continent. He need only mention the case of one city, with a population of 150,000, where the expenditure of the Water Company was £999,000, or at the rate of over £6 per head, whereas at Potsdam, with a population of 60,000, this Company had only expended £113,000, or less than £2 per head, in the completion of their well-organized and effective works. The result in the former case was that the Company were in a disastrous condition, whereas the City of Potsdam Company hoped in a very short time to be in a flourishing state. The capital had increased in the last half year by £2000, of which sum £1158 had been required for the extension of the pipe system for the supply of the Railway Company, the Cemetery, and some public buildings; but, inasmuch as the additional rent paid yielded a good profit on the expenditure, the Shareholders would not regret that it had been made. Everything had been done to promote economy in the working expenditure, and the Directors, looking at the condition of the Company, and seeing that some little time must elapse before the payment of a dividend, had felt it their duty and their pleasure to diminish their fees until such period as the concern should show a fair profit. The Secretary (Mr. O'Halloran) had resigned his position, and gone to the antipodes with the best wishes of the Directors, and the Directors had secured for his office, at a diminished expense, the services of Mr. Duke, who had been the Auditor from the beginning. The only thing now required was the extension of the business, and, as the Magistracy had pronounced the water supplied to be all that could be required, and had urged upon their fellow-citizens to avail themselves of it, it was to be hoped that it would not be long before such a result would be obtained.

Mr. KARUTH seconded the motion, and remarked that the complaints as to the quality of the Company's water, to which the Chairman first alluded, arose from a stoppage in the pipe system. Since that obstacle had been removed, the complaints had ceased, and it was from that time that the certificate of the Magistrates dated. The opposition of the Council was not general, but existed only among a few members.

Mr. HARRINGTON, having spoken of the paramount importance of a supply of pure water at Potsdam, referred to the revenue account of the Company, and expressed an opinion that notwithstanding the arrangement which the Chairman had mentioned, the remuneration of the Directors was too high.

The motion was then put and carried.

The retiring Directors were re-elected, and Mr. Latreille was appointed Auditor of the Company.

On the motion of Colonel BURDETT, seconded by the CHAIRMAN, a vote of thanks was given to the Concessionaire, and also to the Contractor, for the manner in which they had upheld the interests of the Company, and the successful way in which the work entrusted to their care had been executed.

Mr. JUNG and Mr. KARUTH having acknowledged this compliment, the proceedings terminated with a vote of thanks to the Chairman and Directors.

Since the above was in type, we learn that an important addition to the Company's revenue is likely at once to be derived, by the transfer of the whole of the customers of the Royal Water-Works of Potsdam to the Company.

#### HEREFORD CORPORATION GAS-WORKS.

The Gas Management Committee of the Hereford Corporation have recently consulted Mr. G. W. Stevenson, C.E., in reference to the condition of their works, and the best means for carrying out necessary extensions. The following points were specially submitted to Mr. Stevenson, and his opinion asked thereon:—

"1. To examine the present works and plant, and report as to the extensions absolutely required, or any available or desirable improvements, and the probable costs.

"2. To examine the land proposed to be purchased from the Joint Railway Companies; also the site of the Manager's residence and garden, and to report as to the area for present and future extension.

"3. To examine the site of the present waggon-works, and report as to their fitness for conversion into gas-works, with a rough estimate of probable cost of removal of present works and construction of new ones, having reference to the fact that some works must be kept going pending any removal.

"4. Compare the relative advantages of the two schemes."

At the monthly meeting of the Town Council on Thursday, the 7th inst.—the Mayor (Mr. W. Stallard) presiding—the following report from Mr. Stevenson was brought up and read:—

"4, Westminster Chambers, London, S.W., Jan. 31, 1873.

"The Gas Management Committee of the Hereford Corporation.

"Gentlemen,—In obedience to your instructions, I visited Hereford on the 11th inst., and made a view of the gas-works and lands adjoining, and of a site known as the waggon-works, to which my attention was directed as a possibly convenient situation for the erection of new gas-works. Your Manager accompanied me throughout, and several members of your Committee were good enough to meet me at the waggon-works.

"From information supplied to me by Mr. Davis, I learned that the make of gas doubled itself in the 10 years between 1860 and 1870, but that it occupied 14 years in doubling itself during the period ending Dec. 31, 1872. The rate of increase during the latter period is 5 per cent. in the compound ratio; and this is, according to my experience, which extends to all parts of the kingdom, the normal rate of increase of most gas undertakings. It is frequently greater, but rarely less, so that practically, I think, you may look forward to the average increase of the last 14 years as the probable increase of the future.

"The make of gas during the year 1872 was 54½ million feet, and there has been during the present season nearly 300,000 feet sent out from the works in a single day.

"The retorts and retort house are well designed and substantially built



and are sufficient not only for immediate, but for moderately prospective, requirements.

"Everything else upon the works is more or less deficient, both in capacity and construction, for even present use. The condenser has less than half the proper surface, and it is so constructed and so placed as to cool the gas too quickly. There is no scrubber for extracting the ammonia. The engine and exhauster ought to be in duplicate, to meet the possibility of a breakdown. The purifiers have each an area of 100 feet, whereas each purifier, to meet present necessities only, should have an area of 250 feet. The storage capacity of the holders is 162,000 feet, instead of 300,000; and both holders are rickety and untrustworthy. The means of storing coal and the yard space for coke are equally insufficient. A new station-meter, to register the quantity of gas made, and a governor, to regulate the supply to the city, are absolutely required. It can only have been by the most assiduous, and at times anxious attention, on the part of your Manager, that the supply of gas to the city during mid-winter has been maintained, and I am really surprised to learn that he has escaped disaster. Of one thing I feel confident—namely, that the Consumers cannot have had all the gas they desired, and that the deficiency in quantity has been compensated for, as far as possible, by the use of cannel, for the purpose of giving an increased illuminating power.

"I need scarcely say that the conduct of a gas-work, or indeed of any business with insufficient appliances, is the reverse of economical. If the prudent expenditure of capital be withheld, the result is certainly a diminished annual profit.

"The extensions, absolutely and immediately required, together with their probable cost, are set forth in the following statement:—

*"Cost of Additional Land and Works at the Present Site.*

Land belonging to the joint Companies and the Great Western Company, say . . . . .	£900
Covering the brook course . . . . .	550
Division of sewer . . . . .	100
Tenants compensation, &c., say . . . . .	150
	— £1700
Two new boilers and duplicate engine and exhauster . . . . .	750
Mann and Walker's scrubber, with spiral stairs and small engine . . . . .	500
Four 16-feet square purifiers, with centre-valve and lifting apparatus . . . . .	1600
New buildings, comprising engine and boiler houses, purifying and oxide sheds, meter and governor house, boundary walls, roads, drains, &c., on the additional land, and foundations for apparatus . . . . .	2800
Station-meter and governor . . . . .	430
Tank and gasholder of the working capacity of 250,000 feet . . . . .	6250
	£14,030

"The present works occupy an area of about an acre and a quarter, and with the additional three-fourths of an acre, which may be acquired from the Railway Companies, there would be nearly two acres in the whole. By taking the land now covered by the Manager's house and garden, and using it for works purposes, the present producing and storing power might be doubled, and the works would therefore suffice for the next 14 years; but I cannot conceal from my own mind, and I ought not to leave you in ignorance of the fact, that the site would be improperly and inconveniently crowded, and the business could not be so economically conducted as it would be with well-arranged plant on a larger area.

"The waggon-works' site is well adapted for gas-works. It has the advantages of not being too near nor too far from the populous parts of the city, of being at a sufficiently high level to be beyond the danger of floods, and of being in direct communication with the railways, by a siding now constructed and embracing a double line of rails. The area of six acres is amply sufficient for all reasonable prospective requirements.

"The cost of new works and appliances of the latest and most approved kind for a daily make of 300,000 feet, and designed so as to admit of being duplicated when required, would be as follows:—

*"Cost of New Works for 300,000 Feet per Day on the Waggon-Works Site.*

Land, say . . . . .	£5000
Retorts and fittings complete, within the house . . . . .	2000
Condenser . . . . .	400
One scrubber, Mann and Walker's, 40 feet by 6 feet . . . . .	500
Engines, boilers, exhauster, and pumps in duplicate . . . . .	800
Four purifiers, 16 feet square . . . . .	1670
Station-meter . . . . .	350
One gasholder and tank, working capacity 300,000 feet . . . . .	7500
Governor . . . . .	80
Weighbridge for trucks . . . . .	120
Connecting-pipes and valves . . . . .	400
The building, boundary walls, roads, drains, &c. . . . .	£7500
Less materials on ground . . . . .	500
	7000
	£25,820

"In neither estimate have I included legal and engineering charges, nor have I thought it right, in the estimate for works on the waggon-works site, to include the cost of a new leading main-pipe into the city, because the main from the present site is much too small, and must be taken out and replaced with a larger one. The cost in this respect would be much the same whether the present works be extended or new ones erected elsewhere.

"The advantage of continuing to occupy the present site and to extend operations there, as compared with purchasing a new site and erecting entirely new works, would be the avoidance of an immediate expenditure of some £12,000. Beyond this I do not know of any advantage in continuing the works where they now are. The disadvantages are numerous, and may be summed up briefly thus:—1. There is no direct communication with the railway. 2. The land is liable to be flooded. 3. The area, even if enlarged by the purchase of another three-fourths of an acre, will be very contracted, and inconveniently crowded when fully occupied. 4. The works and apparatus, except the retorts and retort-house, which may be worked out in great measure even if other works be erected, are not of any value. 5. Lastly, when the next 14 years shall have elapsed, it will be impossible to continue there longer, and any expenditure now made will consequently have been profitable only for that period, instead of 30 to 40 years.

"The other site possesses all the advantages which the present site fails to possess. The siding will effect a present saving of £137 10s. per annum, which, capitalized at 5 per cent., is equal to £2750 in reduction of the purchase-money, and I need not add that in 14 years hence, when the business shall have doubled itself, and when double the tonnage of coals will be brought into the works, the annual saving in cartage will be doubled, the capitalized value of which will be £5500, or more than is asked for the freehold and buildings upon it.

"I am always averse to recommending the abandonment of an existing gas-work, because it necessarily involves a large increase of capital. Nothing but public necessity or reasons such as apply in this case can

warrant it. But I do think, looking to the state and condition of the present site and work, and to the necessities of the proximate future, that you would exercise a wise discretion by building your new works on another site. I do not say the waggon-works site. There may be, and I believe there are, other sites equally suitable, and with which railway communication may be effected. If you consider the sum demanded for the waggon-works site reasonable, there is nothing to prevent your securing it for your purposes. On the contrary, as I have previously stated, it is in every respect suitable and desirable. If, however, you consider the sum demanded unreasonable, my advice is that you should search for another site, rather than expend so large an amount as £14,000 in additional works upon the present site.

(Signed) "GEORGE WILSON STEVENSON, C.E., F.G.S."

Alderman ANTHONY thought that as Mr. Stevenson's report had only just been received, it would be better to defer the discussion of it until a special meeting of the Council was called for the purpose. He moved a formal resolution to that effect.

Alderman BOSLEY suggested that the Committee should report upon it first, and a special meeting be held afterwards.

Mr. JAMES said he apprehended the Council were not disposed to come to any decision that morning; the subject was far too important. He should be happy to second Mr. Anthony's proposition; but, at the same time, he thought this would be a convenient opportunity for any Member of the Council to ask for any information he wanted, or throw out any suggestion. There were two little matters he should like to mention in that sense. Mr. Stevenson referred somewhat extensively to probable increase, and the past increase in the consumption of gas in the city, and that, of course, would form a material element for consideration. At his request Mr. Davis, the Gas Manager, had furnished him with a tabular statement showing the consumption of gas for the last 17 years, and also the probable length of each main, and the probable cost in the case of the present site, and also of the proposed new site. It was a mere approximation, and the information was not sufficient for them to arrive at a correct conclusion, but it would be useful to them. The statement was as follows:—

*Quantities of Gas produced at the Hereford Gas-Works during the following Years:—*

1860—20,152,000 cubic feet.	1869—37,236,000 cubic feet.
1861—21,213,000 "	1870—40,505,000 "
1862—22,694,000 "	1871—44,266,000 "
1863—24,463,000 "	1872—44,626,000 "
1864—27,327,000 "	1873—48,086,000 "
1865—30,226,000 "	1874—47,784,000 "
1866—32,605,000 "	1875—51,318,000 "
1867—32,389,000 "	1876—53,629,000 "
1868—34,683,000 "	1877—54,194,000 "

*Cost of Mains from Waggon-Works Site.*

Waggon-works to Eign Street, through Edgar Street, 1485 yards of 16-inch, at 28s. 6d. . . . .	£2077
Eign Street to Broad Street, 230 yards of 14-inch, at 20s. . . . .	230
High Street to Hull's corner, 82 yards of 12-inch, at 17s. 6d. . . . .	72
	£2379

*Cost of Mains—Present Site.*

Monkmoor Street to Hull's corner, 480 yards of 16-inch, at 28s. 6d. . . . .	£684
High Street to Broad Street, 82 yards of 14-inch, at 20s. . . . .	82
Eign Street to Edgar Street, 250 yards of 10-inch, at 15s. . . . .	172
	£938

Replying to Alderman Bosley, Mr. JAMES said the Committee had not definitely fixed upon the site intimated.

Mr. SHELLARD said Mr. James had intimated that this would be a good opportunity for asking for information. There were two or three points upon which he should like to obtain information. First, as to where the money was to come from?

Alderman ANTHONY: From posterity partly.

Mr. SHELLARD said he feared posterity would not look back to the present generation with gratitude for having taxed their heirs for their own benefit. If, in the case of the smaller outlay, they had a substantial property, he could quite understand there would be comparatively little difficulty in borrowing the money required; but supposing that they thought proper to adopt the larger schemes, and purchase the waggon-works, or any other property, for the purpose of increasing the supply from the works, he should like to know in what way the money was to be raised to meet the larger expenditure, because he apprehended that the Council were not prepared to borrow £30,000 for that purpose. Then where was the money to come from?

Several MEMBERS: Rates.

Mr. SHELLARD: That is what I want to know?

The MAYOR: It will no doubt be embraced in the Committee's report.

The TOWN CLERK said he had no hesitation whatever in answering the question, because the Council had ample power to borrow money for any purposes in connection with the gas-works.

Mr. SHELLARD: Borrowed upon the security of the rates?

The TOWN CLERK: Undoubtedly. The Lords of the Treasury sanctioned to any extent. He was not quite sure, however, whether the power to sanction was not transferred to the Local Government Board. This would make a difference with regard to the preliminary proceedings. The Lords of the Treasury might or might not hold a local inquiry, but with the Local Government Board it would be a *sine qua non*.

Mr. SHELLARD: I only wanted to know upon what security the money would be borrowed, and as to whether it would necessitate an inquiry before we obtained power to borrow.

The TOWN CLERK: Undoubtedly, if the Local Government Board have it.

Mr. SHELLARD said he thought this was an important question. He had given considerable attention to the report, and should have been prepared to go into the matter pretty fully if desirable. A suggestion had been made to refer the report to the Gas Management Committee for them to report upon. Theoretically the suggestion was a good one, but not practically, because the Committee would take up a great deal of time, at the gas-works, discussing the question *pro and con*, and in all probability the Council would have to go over the ground again. It was pretty certain some of them—most of them, in fact—wished to express an opinion upon the matter, and, therefore, he suggested that instead of referring the report back to the Committee, they should hold a special meeting, as suggested by Mr. Anthony, and then the subject could be fully gone into by the Council themselves. There was one point which might be attended to meantime, and it was an important one. They had been for a long time in correspondence with the railway authorities, with a view to the purchase of land for the extension of the gas-works. For a long time they were unable to obtain the consent of the railway authorities to the sale, but now they had given their consent, and were pressing the Council for an answer. He suggested that the Gas Committee, or the Town Clerk, or whoever it was thought fit to instruct, should communicate with the railway authorities, and ask them whether, in the event of the Council deciding upon the purchase of land for the extension of the gas-works, they would accommodate them with a siding. That was one of the most



crucial points in the two schemes mentioned in the report of Mr. Stevenson, and would influence him very considerably in giving a vote. The railway from the Barton ran within a stone's throw of the proposed site, and there would be no difficulty in providing a siding.

Alderman ANTHONY said that, of course, the Committee would meet and go into all these matters, which the Council could not, as a body, thoroughly discuss, and they would report the result of their deliberations. The foundation of their report would be based on this discussion.

Alderman BOSLEY said that, in making the suggestion that the Committee should report upon the report, his object was to facilitate business, because they would certainly have a better opportunity of getting all the necessary information. Questions of detail were proper things for the Committee to take up, and the Council should be guided by their recommendations made upon diligent and minute inquiry. The question of the expense, and the way it was to be met, would also be best left to the Committee. It was the most practical and feasible way of dealing with the matter. He, therefore, proposed that Mr. Stevenson's report be referred back to the Committee to send up a report supplying all particulars and furnishing recommendations.

Mr. BEZANT considered the subject had been brought forward prematurely. It was somewhat irregular to have private reports published in the newspapers before being considered either in Committee or by the Council.

Mr. SMITH said it was irregular, but he thought the proceedings should not be stopped on that account. The ratepayers were all very much interested in the question. Mr. Stevenson's report was very good as far as it went, but the Council wanted a great deal more information before they decided. There was another question. Before the Corporation bought the gas-works, a gentleman named Cleminshaw came down, and drew up a report upon the works. He wished to know if that report could be produced. It ought to come before the Corporation.

Alderman ANTHONY said it could go before the Committee, who might incorporate it in their report.

Mr. SMITH said he wanted it to go before the public. His impression was that the Corporation purchased the works on the strength of the opinion expressed in that report, that they would be adequate to the requirements of the town for 14 or 15 years.

The MAYOR said there was no objection to the report being produced. The Corporation had not consulted any one but Mr. Stevenson, and he was not the gentleman who examined the works when the purchase was made.

Alderman SYMONDS said he understood the questions raised in the report made by Mr. Stevenson to be very simple. The Council had to decide between purchasing the waggon-works at a very large amount of money, or utilizing and enlarging the present buildings. He hoped the Committee would not confine their attention solely to the two sites suggested, but would consider any and every other available site.

Mr. SHELLARD suggested that the Finance Clerk should send copies of Mr. Cleminshaw's report to the newspapers for publication with that day's proceedings.

Alderman CAM considered that the reports should be printed and circulated amongst the members before the next meeting, to give them time to consider them thoroughly.

Mr. RALPH agreed with Mr. Smith that it would be well to have Mr. Cleminshaw's report, but he found that the Gas Manager had not got it; it was before his term of office. There was no doubt the report of Mr. Stevenson had created some amount of alarm, because it was a big sum of money that was proposed to be expended. It was either a question of £14,000 or £30,000. But whichever it was, he was not at all alarmed, nor did he regret that they had become the purchasers of the gas-works, because he felt perfectly satisfied that if they spent £30,000 they would be able to carry on the works and supply gas without taxing the city with a single penny. They had found interest and instalments to the extent of £3300 a year, and in the short time they had had the works they had saved, in round numbers, £5000. If they wanted to borrow money, the saving they had made would be sufficient to pay the interest on an instalment. Therefore he did not regret the purchase. As to the proposed alterations, it was very different from starting a concern which would be an expensive matter. Here they had a going concern, paying a good interest. He dared say some of the members thought they could not count upon the continued increased consumption of gas which had been going on. It was a remarkable fact that between 1860 and 1870 the consumption of gas doubled. Of course, they could not calculate upon its doubling again between 1870 and 1880. Between 1860 and 1870 it was only a question of increasing from 20 millions to 40 millions; but between 1870 and 1880 it would have to increase from 40 millions to 80 millions, or at double the rate. Still, the remarkable fact remained, that in the seven years, 1860-67, the increase was less than in the seven years, 1870-77, showing that the increased consumption continued, and at a growing rate. They had no reason to be alarmed at the expenditure, so long as the increase continued. He knew nothing that paid so well as water-works and gas-works. Whatever the Committee recommended, he would be perfectly satisfied with, because he knew they would do what was best. But he did not think any one would advise spending £14,000, unless it was to last more than 14 years. He hoped whatever action was taken would be for the benefit of the city, not only in the immediate future, but for a considerable time to come.

The MAYOR said that the resolution of Mr. Anthony, which was seconded by Mr. James, was that the consideration of Mr. Stevenson's report be deferred until the Gas Management Committee could report upon it; and they could call a meeting of the Council at any time before the next monthly meeting and submit their report. All the questions which had very properly been mentioned that day would engage the serious attention of the Committee before they reported on the scheme. They would not be wedded to any particular site, but would recommend what they considered to be best for the citizens, and report as favourably as they could.

The resolution referred to by the Mayor was carried unanimously.

#### THE WIGAN CORPORATION AND THE STANDISH LOCAL BOARD.

##### THE CORPORATION GAS ACCOUNTS.

At the Meeting of the Standish Local Board, on Monday, the 4th inst.—Mr. PERCY in the chair—the following report of the law-clerk, Mr. Lees, was presented:—

Gentlemen.—On the 18th ult. I received through the post, from the Town Clerk of Wigan, the Wigan Corporation Gas-Works account for the half year ending Dec. 31, 1876.

By the Wigan Gas Act, 1861, and the Wigan Improvement Act, 1874, the Corporation of Wigan have the sole right of supplying their own borough and certain urban districts, including Standish, with gas. Although they have this monopoly, it is clogged and edged in by certain stringent statutory obligations, which are embodied in the Gas-Works Clauses Acts, 1847 and 1871, and the Wigan Improvement Act, 1874. Such provisions are for the benefit of consumers, and were inserted by the Legislature for very obvious reasons.

The Local Board of this district are prevented, by the before-mentioned monopoly,

from supplying their district with gas, but are clothed with ample powers to enforce the provisions of the said Acts, for the benefit of the consumers within their district, and considering that the undertakers of the gas-works at Wigan are the Corporation, it is doubly incumbent upon the Board that they should scrutinize with great care the accounts of the undertakers, and see that no items of disbursement are inserted which are not properly chargeable to the gas accounts, and prevent the ratepayers of this district from contributing to the burden of the Wigan rates. An attempt to impose these burdens has already been made—viz., the salary of £150 to the assistant Town Clerk, directed by the Corporation to be paid out of the gas account some few months ago.

The 35th section of the Act of 1871 imperatively enacts that the undertakers shall, on or before the 25th of March in each year, furnish to the Local Authority of every district an annual statement of their gas account, according to the form specified in Schedule B to the Act, and imposes a maximum penalty of 40s. for each and every day during which default is made.

A glance at the account received by me will show that it is not an annual one; it purports to be made up for the half year ending Dec. 31, 1876; it does not appear when it was made up, but it clearly appears that it was not audited till April 5, 1877 (ten days after it ought to have been delivered to me), and was not delivered to me till Jan. 18, 1878.

The Corporation have, therefore, committed a very serious breach of the provisions of the Gas Act, inasmuch as they have been in default for 333 days, the maximum penalty for which would be £666; and if they have treated the other four districts like Standish, the penalty becomes a serious matter. The case is clear against them, and is at once proved by the production of the account and the Town Clerk's letter. The Corporation must have known all along that they were in default, as the Editor of the *Wigan Observer* had on two or three occasions drawn their attention to the fact.

The course for the Board to pursue, under the circumstances, is to decide whether they will exercise their powers of protecting the interests of the consumers in this district, and take out summonses before the justices at Chorley to enforce the penalty, or leave it to the consumers to take action themselves, which would be a more roundabout and expensive process.

Another obvious reason why the accounts should be delivered as directed by the Act is, that the Board may see that the undertakers are not making too large a profit, and keeping up the price of gas. If this account had been delivered to me in March, 1877, I should have advised the Board, seeing that the undertakers have claimed as making £10,000 profit in six months, to have insisted upon a then immediate reduction in the price of gas. The equity of this is admitted by the action of the undertakers in reducing the price of gas as from the 1st ult., but the reduction ought to have been made as and from the 1st of January, 1877; and if the Corporation accounts are to be credited as to their profit, a Court of Equity would at once decree the rebate.

The Acts also impose obligations upon the undertakers with regard to, and specify, the illuminating power and the pressure under which gas is to be supplied. From the many complaints which are made, not only in this district but in Wigan, it is quite clear something is wrong, and I should advise the Board to solicit a conference with other urban districts in the Wigan Union, and see if arrangements could not be made for the joint appointment of a Gas Examiner and Tester, under the 29th section of the Act of 1871. No Gas Examiner has been appointed within the true meaning of the section. This may be an error on the part of urban districts, as the Examiner would be at liberty to enter the works of the undertakers, without notice, between five and ten in the evening, between Oct. 1 and March 31, and between eight and eleven o'clock in the evening, from April 1 to Sept. 30. He would also be at liberty to bare the pipes and test the pressure of gas in any part of the district, on giving two hours notice. His duty is then to immediately report, and if the gas is found deficient, or given at too great or too little pressure, proceedings can be at once taken to recover penalties imposed for the different offences. It might be a matter well worthy of the Board's attention as to whether they would not now, seeing the continued unsatisfactory state of the gas question, apply for powers to make and supply gas within their own district, or encourage the formation of a Company for that purpose. I feel no doubt that their case would be a strong one, and would be accepted to.

(Signed) WILLIAM LEES.

On the suggestion of the Chairman, the report was ordered to lie on the table, the consideration of it to be taken up at the first meeting at which Mr. Lees was able to attend.

#### ANALYSIS OF AUSTRALIAN SHALE.

In the early part of last year we recorded the arrival in the London Docks of a cargo of "Hartley mineral" or Australian Boghead. Our readers will be pleased to see a report as to the quality of this mineral, by an able officer of The Gaslight and Coke Company, with which we have been favoured by the importers, with permission to publish the same:—

"The Gaslight and Coke Company, March 3, 1877.

Analysis and Report on Australian Shale received from Messrs. W. Mort and Co., 155, Fenchurch Street, ex "Martin Luther," Jan., 1877.

Dear Sirs,—According to your instructions, I have pleasure in forwarding you my report on this coal. It has been carefully tested, and a series of analyses made experimentally, and the following results have been obtained:—

Chemical Analysis.		
Volatile matter . . . . .	70 per cent.	
Coke { Carbon . . . . .	8	"
{ Ash . . . . .	22	"
	100	
Purified gas per ton of shale . . . . .	15'399	" cubic feet.
Illuminating power (standard test) . . . . .	46'35	sperm candles.
Hydrocarbons condensable by bromine . . . . .	24'05	per cent.
Sulphuretted hydrogen in foul gas . . . . .	0'5	"
Carbonic acid in foul gas . . . . .	1'7	"
Ash in coal . . . . .	22'0	"
" coke . . . . .	74'5	"
Sulphur in coal . . . . .	0'49	"
Tar per ton of shale . . . . .	40	gallons.
Liquor per ton (4 oz. strength) . . . . .	24	"
Coke and breeze per ton . . . . .	4½	per cent.
Specific gravity . . . . .	10'60	

The illuminating power ranged from 38'46 to 48'32 sperm candles. This is a remarkably rich cannel coal; it yields a large amount of gas of high illuminating power.

(Signed) ALFRED KITT.

BORING FOR COAL IN KENT.—Though the deep boring in the Wealden and at Messrs. Meux's was not fruitful of practical results, it secured valuable scientific information. Further explorations have been determined on in the vicinity of Dover or Canterbury, and an influential Committee have, it is stated, been formed. It is proposed to raise £5000 by subscriptions, and to commence the work, which will be entrusted to the Diamond Rock-boring Company, as soon as promises to that extent are received. With the powerful machinery which can be employed there will be no difficulty in reaching a depth of 2000 feet in nine months; and as the first 1000 feet would be a 6-inch bore, and the remainder of the depth proportionate, there would be a favourable opportunity for accurate experiments on underground temperature, and which no doubt will be made use of. In selecting a site, the Sub-Committee consider that an area of depression such as that which lies on the south side of the chain of the Ardennes, and of the Mendips, should be avoided, and the old area of elevation formed by the underground axes of these chains, and continued in a plateau to the north of it, should be sought for, this Silurian plateau having been proved by the borings at Guisnes, Calais, Ostend, and Harwich at 627 feet, 1032 feet, 985 feet, and 1020 feet respectively. In order to make more certain of coming upon the main axis of elevation, and in view of the lower secondary strata there beneath the chalk being possibly comparatively thin, they recommend a site in Kent within the valley of the Stour, south of Canterbury, or at Dover, still nearer to the Channel.



## THE CORPORATION OF YORK AND THE GAS COMPANY.

On Wednesday, the 20th inst., a Special Meeting of the Corporation was held, "for the purpose of further considering the application to Parliament of the York United Gaslight Company, and the opposition thereto, and to adopt such measures thereon as may be deemed expedient." The Lord Mayor presided.

The TOWN CLERK read the following letter from the Gas Company, addressed to himself:—

Feb. 19, 1878.

Sir,—I am instructed by my Directors to inform you that they have given great consideration to the proposal of Mr. Alderman Leeman, that they should agree to insert in their Bill clauses defining the terms of purchase of their undertaking by the Corporation, in the event of Parliament, at any future time, enacting by general legislation that such a purchase shall be made.

My Directors are of opinion, and they are so advised by their Parliamentary Agents, that such a provision is not within the title and preamble of their Bill, neither is it in any way germane to the purposes for which they are asking for parliamentary powers. Further, they have no authority from their Shareholders to enter into such a negotiation and contract. They, therefore, regret they cannot entertain the proposal. So far as the details of their Bill are concerned, the Directors have already evinced their desire, and are yet prepared to confer with the Sub-Committee of the Council with a view to meet their wishes on several of the most material points.

My Directors desire me to point out that the Bill is one purely for the benefit of the consumers of gas in this city and its suburbs, and that they seek the extension of their present large and valuable works in preference to the erection of new auxiliary works elsewhere, because they believe that they will thereby be enabled to meet the increasing wants of the city at much less cost than must necessarily be entailed by the erection of a second set of works, and the maintenance of duplicate establishments. They would also point out that the site of the proposed extension is at present a low marshy ground, frequently flooded, and, in its existing state, highly prejudicial to the public health.

As some misapprehension exists in the public mind as to the provisions in the Bill with reference to the manufacture of residuals, my Directors wish me to draw your attention to the fact that they are seeking no additional powers for this purpose beyond those which they now possess.

My Directors, in their course of action, whilst protecting (as in duty bound) the existing interests of their Shareholders, believe that they have submitted to Parliament a scheme which is best adapted to provide at the cheapest rate for the wants of the city, and they therefore feel they are entitled to the support of the City Council. A different course of action by that body would be, in their opinion, highly prejudicial to the city, and would ultimately entail a material addition to the present moderate charge for gas made by the Company, which bears a favourable comparison with any other works in the United Kingdom.

(Signed) CHARLES SELLERS, Secretary.

Alderman LEEMAN, M.P., in a long speech, moved the adoption of the following resolution:—"That on further consideration of the application to Parliament by the York United Gaslight Company for additional powers, and the letter of the Secretary of the Company, now read, in reference thereto, this Council are of opinion that the refusal of the Company to meet the reasonable conditions which have been proposed by the Committee for the protection of the interests of the citizens, renders it incumbent upon them to offer the most strenuous opposition to the passing of the Bill, and that the Lord Mayor be requested to call a special meeting of the Council, under the Municipal Corporations (Boroughs Funds) Act, for the purpose of obtaining the necessary authority to proceed with the petition already presented against the Bill, and of defraying the expenses of and incident to such opposition."

Alderman MARCH seconded the resolution, which was opposed by Mr. Brown and others, but on a division was carried by 15 to 8.

The following protest has since been received by the Lord Mayor:—

To the Right Hon. the Lord Mayor of the City of York.

We, the undersigned, Members of the Municipal Council of the City of York, hereby enter our protest against the special meeting of the Council held on Feb. 20, 1878, "for the purpose of further considering the application to Parliament of the York United Gaslight Company and the opposition thereto, and to adopt such measures thereon as may be deemed expedient," being regarded as a legal meeting, as the requirements of section 69 of the 5th and 6th William IV., cap. 76, commonly called the Municipal Corporations Act, have not been complied with, and consequently all resolutions passed at such meeting, and all proceedings taken thereon, are null and void, and contrary to law.

JNO. BROWN.  
E. T. WILKINSON.  
HENRY SCOTT.

Dated this 22nd day of February, 1878.

## THE FATAL ACCIDENT AT THE IPSWICH GAS-WORKS.

The adjourned Inquest on the body of William Last, the man who lost his life in the sulphate works of the Ipswich Gas Company, on the 4th inst., was resumed on the 18th, at the Town Hall, by the Coroner, Mr. H. M. JACKMAN.

At the opening of these proceedings, the CORONER expressed his satisfaction in being able to inform the Jury that Noble, the other man, who was injured by inhaling the sulphurous fumes, had so far recovered as to be able to attend and give evidence. The first witness called was

Mr. W. J. Allison, who said he was a chemist, and had been ten years in the service of the Company, and had managed the sulphate of ammonia manufacture. He was not assisted by any one. He was not in the sulphate works on the day of the accident, having been sent by Mr. Ford Goddard, from whom he received instructions, to the purifying-house. Mr. Goddard had expressed some dissatisfaction with him. He did not know who was to succeed him. He knew that dangerous gases were evolved during a portion of the time that the sulphate was in course of manufacture. In his opinion Noble was not competent to undertake the work, even under the instruction of the foreman, though he had frequently been in the works. The sulphuric acid was supplied to the saturator from a carboy by means of a jug. The carboy was generally raised on a stool. The lid of the saturator was kept open during the filling, which was not a dangerous practice after the steam passed off. He as often worked with it off as on after the first half hour. Deceased would, no doubt, have learned the process after a time. It was not a difficult thing, but required attention.

Mr. GODDARD said the witness himself learnt it in one day.

Witness admitted that he was with Mr. Laurie, of Yarmouth, from whom he learnt the process only for one day. He thought deceased came by his death through lifting the lid off to put the acid in before the time, just as the steam began to make. He had himself been knocked down by the gas several times, and had seen others knocked down also.

In answer to Mr. GODDARD, witness said he had never reported any case of a man having been knocked down by the gas.

Mr. D. F. GODDARD: How came you to tell me on Tuesday that you never had an accident with the gas?

Witness: I do not call that an accident—getting knocked down with it, when you are able to get out without assistance.

A JUROR: Then you call sudden death an accident?

Another JUROR said he thought the witness should not be allowed to leave the box without correcting his statement as to his occupation. He stated that he was a chemist, which would convey the impression that Mr. Goddard had taken off a man well acquainted with chemistry, and put on a labourer.

The CORONER said it was the witness's statement. Mr. Goddard could make any addition to his evidence he desired.

In answer to Mr. D. F. GODDARD, witness explained that the stool on which the carboy was put was only for the purpose of tilting the carboy.

Some JURORS complained that the witness conveyed a wrong impression when he said he was to work in the purifying-house for Monday; they

thought he intended to convey that he was going back to the other work on the Tuesday.

Thomas James Noble, having been cautioned by the Coroner, said: I am a gas engineer, and have been in the service of the Ipswich Gas Company 21 years. I was at the works on the Monday morning at half-past five. I saw Last at the boiler fire. I had on the Saturday received from Mr. D. F. Goddard some instructions to give the deceased as to the manufacture of sulphate of ammonia. Deceased appeared to understand the instructions, and had begun the work on the Monday when I went. He had lighted the fire at the boiler, and was clearing away the ammonia made on a previous occasion, and he emptied the "mother" liquor, or the liquor that remained in the tank.

Mr. E. GODDARD said the mother liquor was the liquor which did not crystallize.

Witness: He was doing so to clear the holes in the pipe; but before he did so, I got a piece of candle to ascertain whether it was safe for him to reach over. Having ascertained that it was, deceased reached over and cleared the holes, and I instructed him then to put sufficient liquor back to cover the holes, and after that to put four or five jugs of acid into the tank. I told him when the boiling commenced it was to be left for an hour and a half, and not interfered with. I told him on the Saturday, and on the Monday too, that it would be dangerous for him to interfere with it during that time. After that time he could ascertain whether it was safe by going to a peg in the pipe leading from the boiler. On the Monday morning, when I went, I found there was no peg in this hole. Deceased obtained a piece of wood, I made a peg, and he put it in. After that I left him, and went about the works to see after the other men. I looked in just before breakfast-time, about eight o'clock, and deceased was then clearing the smaller saturator, preparing it for work, as he had done the other. I returned from breakfast at twenty minutes past nine. I met deceased coming out of the works gates; he said he was going for some bread. I went on to one of the workshops to see if the men were there, and was passing to another part of the works, when I went into the shed where deceased was at work. I did not see him at first, but I was not surprised, as I had seen him going out, and he came in directly after. I stopped to ascertain whether deceased had replaced a wood plug in the small boiler. I said, "Have you got this plug all right?" He said, "Yes;" and I was about leaving, when I heard a choking noise. I turned round, saw deceased stagger, and ran to him. I said, "Bill, what's the matter? You must come out of this." I tried to get him out of the place; but in almost as short a time as it takes to tell, his head fell back, his legs slipped from under him, and his weight pulled me down with him. I tried to raise his head up, and then I felt my strength fail me, and I know nothing more that occurred. I did not observe the position of the lid of the saturator. I was hardly in the place three minutes. I do not know that any sulphuric acid was put in after breakfast. I had explained to him as to adding sulphuric acid. I told him, after the hour and a half, having ascertained by the peg whether it was safe, that he was to add a jug of sulphuric acid at intervals. I explained to deceased that it was necessary to keep in a standing position when adding the sulphuric acid, and that the gas would be near the floor. I told him that the lid should be kept closed. I made him put the lid on before any gas was generated in the morning, that he might understand the right way. In my opinion he was quite competent to perform the work he was called upon to discharge. When I spoke to him on Saturday, he seemed to consider that the work he had previously performed at the tar-works at Bramford was more important than this. He was quite conversant with the fact that there were dangerous gases being evolved, because that was why I told him to put the acid in first, that he might have no occasion to go to the tank before the hour and a half. I cannot give any evidence as to how he came to stagger. If I could have remained upright I do not think I should have felt any evil effects.

By the CORONER: I have never known other men to have been knocked down by this gas before. I do not think a man needs to possess any knowledge of chemistry to perform the work. The directions I received from Mr. Goddard were so plain and simple that, if I were strong enough, I should have no hesitation to go and undertake the work singly myself to-morrow, although I had not done it before. I have no knowledge of chemistry. I suggested Last to Mr. Goddard for two reasons—first, because he was a good man for the mornings, and likely to be in time; and, secondly, because he had held an important position at Bramford. I believe deceased had charge of a still at Bramford, but I do not know the precise nature of his work there. He did not express any disinclination to take this work. I never assisted in the manufacture of sulphate of ammonia before. I knew the dangerous character of the gas evolved.

The depositions were then read over. On coming to the evidence of Mr. E. Goddard, that gentleman expressed a desire to make a statement.

Mr. Goddard said: The first witness called this evening has represented himself as a chemist at the works. That was not quite the position he occupied. He came to the works as a labourer at 12s. a week. He was put to this department of work after his father left, and carried it on until Monday last. There is no necessity in manufacturing chemistry to engage a skilled man for such work as this, and we should not have thought of employing a chemist for the purpose. It is mere labourer's work. As one of the Jury properly said, it would give the public a false impression if it went forth that the man Allison was a chemist.

The CORONER summed up the evidence, and explained the law on the case. He said the first question the Jury would have to consider was, what was the cause of the death of the deceased. He thought they could have no doubt that it was caused by asphyxia, produced by the inhalation of the poisonous gas evolved. Then the question was, How came the gas to escape? Was it the result of carelessness or negligence on the part of any one, or was it the result of an accident? The evidence showed that Noble, the foreman, was to instruct the deceased in the duties which he would have to perform on the day when the accident occurred. Had his evidence satisfied the Jury that he understood the nature of the work in reference to which he had to instruct Last? Undoubtedly, Noble had responsible duties to perform, and he had volunteered to perform the duty of instructing the deceased. Persons in Noble's position, having responsible duties to perform, upon the proper performance of which the lives and safety of persons depended, were bound to exercise the greatest possible caution, and the question for the Jury was whether Noble omitted to use ordinary and reasonable precaution, or whether he did what any man in his position might have been reasonably expected to do. The evidence showed that Noble took the deceased round the works on the Saturday, and explained to him the duties he would have to perform, and that he repeated his instructions on the Monday morning, and the Jury would say whether that evidence satisfied them that Noble properly discharged the responsible duty which he undertook. Noble was the foreman, and had been so four months, and part of his duty was to obtain from Mr. E. Goddard, or Mr. Ford Goddard, instructions for the various departments, and it was quite clear that if there was any responsibility it rested upon Noble. The Jury would, therefore, say whether Noble discharged his duty as far as a man would be expected to do, using ordinary and reasonable care. There was no doubt that the deceased was dealing with deadly agencies; but, did he know that? Noble had distinctly stated that



he explained to Last the consequences of leaving the lid of the saturator off, and that he cautioned him as to the poisonous gas. An inquiry of this kind often did good, for though no one was implicated, it had the effect of acting as a caution to those who had to discharge similar duties, to use greater care and caution. It was a matter of congratulation that during the 30 years this process had been carried on, this was the first occasion in which an accident of a serious nature occurred. Mr. E. Goddard, on behalf of the Gas Company, was desirous that a full investigation should be made; and if the Jury were not satisfied, and wished other evidence, it should be obtained. It was because of a request made by some of the Jury that Allison had been summoned to attend here. That man seemed to prevaricate in some of his evidence. He said in his opinion the deceased was not competent to do the work. The Jury had heard from Mr. E. Goddard and Mr. Ford Goddard, both skilled and practical men, that, in their opinion, the man was capable of performing the duties, and their opinion was entitled to weight. It was the province of the Jury to weigh the evidence, and say on which side the weight of evidence was.

The Jury retired, and after an absence of several minutes, returned into the room, when

The FOREMAN said: We find that the deceased, William Last, came to his death from accidentally inhaling a poisonous gas called cyanogen, and that no blame is attributable to any one. We entirely exonerate Thomas Noble; we believe he was quite capable of instructing the deceased, and he did so. We would recommend that, at this part of the works especially, where the greatest danger seems to exist, conspicuous notices should be put up for the guidance of future labourers.

Mr. GODDARD said the recommendation of the Jury should be carried out.

The inquiry then terminated.

#### SOCIETY OF ENGINEERS.

The First Ordinary Meeting of the Society of Engineers for the present year was held on the 4th inst., in the Society's Hall, Westminster Chambers.

At the conclusion of the ordinary routine business, the retiring President, Mr. THOMAS CARGILL, presented the premiums of books which had been awarded to the following gentlemen for papers read during the past year—viz.: To Mr. J. Walter Pearce, for his paper on "The Mechanical Firing of Steam Boilers;" to Mr. Alfred Le Grand, for his paper on "Tube Wells;" and to Mr. Ralph H. Tweddell, for his paper on "Direct-Acting Hydraulic Machinery." The premiums having been presented, Mr. Cargill retired from the chair, receiving a cordial vote of thanks from the meeting.

The PRESIDENT for 1873 (Mr. Robert Paulson Spice) then proceeded to deliver his Inaugural Address. Mr. Spice first expressed his thanks to the members for the honour they had conferred upon him in electing him President. After alluding to the progress of the Society, the work done by it during the past year, and its present satisfactory numerical, professional, and financial position, Mr. Spice gave a *résumé* of the most interesting and important engineering and scientific events which had characterized the past year. Respecting some of these we make the following extracts from the Address:—

At the present time several important sanitary questions present themselves for solution in connection with our Metropolis and the large towns of the kingdom. The most prominent of these, perhaps, is the Metropolitan Water Supply, about which there has been much discussion of late, and for the improvement of which the Metropolitan Board of Works have deposited plans in the Private Bill Office, which will have to be considered during the present session of Parliament. The objects of the proposed Bills are to enable the Board to purchase the interest of the existing Water Companies; and, on the basis of a scheme prepared by Sir Joseph Bazalgette, the Engineer to the Board, in conjunction with Mr. F. J. Bramwell and Mr. Edward Easton, to provide the Metropolis with an ample supply of pure drinking water, at a pressure which shall also be sufficient to furnish whatever may be required for the purpose of fire extinction. A satisfactory water supply is one of those provisions which all men of scientific training recognize as of the most vital consequence to the welfare of the community, and this at the present moment we certainly do not possess. There is a deficiency in quality as regards health, and in quantity as regards a supply for fire extinction, and it is upon these two points that the Board desire, by their application to Parliament, to set us right. The impurity of the water is, it is true, a matter of degree only, and it is upon this point that the discussions of scientific men and experts mainly turn; the difference between them being the precise degree of impurity which may be tolerated in drinking water. This does not, however, alter the state of the case, which is, that we do really consume impure water, justifying the satire conveyed in the dictum of that physician who is said to have advised that the only way to be secure with London water, was first to filter it, then to boil it, and finally to throw it away. The fact is that we within the metropolitan area derive our supplies of water largely from the Thames and the Lea sources, which are beyond doubt or question contaminated with sewage to a greater or less extent. The Water Companies do their best to purify the fluid they deliver to consumers, by previously running it through a bed of sand and gravel, but that this purification is only partial has been amply proved by analyses, and by the Registrar-General's reports. The Water Companies have also endeavoured to deal with the admitted difficulty, by the removal of their intakes to places higher up the Thames and the Lea, and by adopting improved methods of deposition and filtration. But for all this the present system of water supply to the Metropolis is admittedly defective in two main and essential points. These defects are, firstly, the recourse to sources of supply which, at the very best, cannot be said to be free from suspicion on the score of purity; and, secondly, the inadequacy of the pressure and supply to the heavy demands to which it is occasionally subject for fire extinction. Beyond this, I might suggest a third, which is the great expense attending the management, owing to want of unity. Were the government localized or concentrated, the expenses of administration would, of course, be reduced, and water would consequently be cheaper.

Before stating the main features of the Board of Works scheme, it may interest you if I place before you a few particulars respecting what has previously been proposed in connection with the improved water supply of London. The question is by no means new; for the last half century has seen a number of Committees and Royal Commissions endeavouring to cope with it. The main results of their labours have been the improvements made by the Water Companies in the directions I have already indicated. Several members of our profession have endeavoured to grapple with the difficulties which beset the question, and have propounded schemes which, however, have not been carried out in practice. The first of these was a proposal by Mr. J. F. Bateman to supply London with water drawn from the eastern flanks of the mountain ranges of Plynlimmon and Cader Idris, in North Wales. The water was to be conveyed through an aqueduct 183 miles in length. Mr. G. W. Hemans and Mr. E. Hassard subsequently united in a still bolder scheme, by which it was proposed to supply the Metropolis with water direct from Ullswater and the collecting area of the district, a distance of 249 miles away from

the point of consumption. Mr. G. Remington also propounded a scheme for collecting the waters of the Dove, the Wye, and the Derwent, from the hills of Derbyshire and Staffordshire, at such an elevation as to supply London by gravitation, with the exception of the highest parts of Hampstead and Highgate. These schemes, however, if any one of them were carried out, would only bring the water to London at a cost of some 10 or 12 millions of money, and a further heavy expenditure would have to be incurred for its distribution.

The proposition of the Metropolitan Board of Works is based upon a full consideration of all the various matters and interests affecting the question at issue, into the details of which, however, it is unnecessary for me here to enter. I may, however, state that the average daily supply of water to London is over 30 gallons per head for all purposes. Sir Joseph Bazalgette and his colleagues, however, estimate that not more than two gallons per head is really used for drinking and for cooking purposes, or say 8 million gallons per day for the whole Metropolis. From recent parliamentary evidence, the quantity required for extinguishing fires, although large during the time a fire is raging, is shown to be, on the average for the year, not more than 1-400th of the total supply, or at the rate of 300,000 gallons per day. This gives a total of 8,300,000 gallons per day for potable, culinary, and fire purposes. Looking to the increase of population and other contingencies, a supply of 16 million gallons per day is allowed for. Now, there is ample evidence that a daily supply of 16 million, or even of 32 million gallons of pure, wholesome water, could be readily obtained from the chalk in the outlying districts of the Metropolis. It is, therefore, proposed to sink wells and borings in the great water-bearing strata in the country districts around London, at distances varying from 15 to 20 miles from the centre of the Metropolis. Pumping-stations will be provided for lifting the water into four covered service reservoirs, placed on the high ground to the north and south of London. They are to hold an aggregate of 32 million gallons of water, or a sufficient quantity for four days consumption. These reservoirs are to be at an elevation of 400 feet above Ordnance datum, and from each is to proceed a set of arterial mains, which are to be carried across the Thames, and to traverse the Metropolis. The mains are to be coupled up so as to place all the reservoirs in communication, and thus equalize the pressure throughout. From the arterial mains, supply-mains are to be laid along the streets, and these will be constantly charged with pure spring water under high pressure. This water would be supplied to every house for potable purposes, whilst the same mains, water, and pressure, would be used for the service of hydrant-jets to extinguish fires. For domestic supplies it is proposed to fix in the basement of each house an air-tight pressure receiver, holding from two to ten gallons, according to the size of the house. The receiver is only to have one draw-off tap, and when emptied it is to be automatically refilled. The fire hydrants are each to have four openings for hose, and each hose would deliver 150 gallons per minute 150 feet high, over the principal portion of the Metropolis.

So far both the objects aimed at—namely, a supply of pure water for drinking and similar purposes, and an adequate supply of water under sufficient pressure for fire extinction—would be accomplished without in any way interfering with the existing Water Companies, who might continue to supply the public with water for manufacturing and domestic purposes other than those connected with food. The Board are, however, very properly applying for powers to purchase the interests of the Water Companies, whose undertakings all rest on statutory authority. The whole question is one of great magnitude, and doubtless involves several difficulties. It is one, however, which will undergo a searching investigation at the hands of a Parliamentary Committee, who will, doubtless, see that justice is done to all parties concerned. It is one, moreover, for grappling with which and bringing to its present issue the Metropolitan Board deserve great credit. Opinions vary as to whether a sufficient supply of water will be yielded by the chalk. The balance of evidence, however, is largely in favour of a successful result. The knowledge afforded by the present ample yield of water from the chalk in the outlying districts of the Metropolis, fully justifies the anticipations of Sir Joseph Bazalgette and his colleagues, Mr. Bramwell and Mr. Easton.

It is well, perhaps, that the Engineering Department of the Metropolitan Board of Works is thus moving in a direction which redounds to its credit, for it will probably be put upon its defence with respect to a matter in which its head has earned for himself considerable and well-merited distinction. I allude to the alleged serious deposition of sewage matter in the bed of the Thames, in the neighbourhood of the outfalls of the main drainage of London. I say "alleged," for it is by no means yet proved that such a deposition has taken place—and I am slow to believe that it has—and we must be cautious in accepting any statement of this character, when we consider what the forces of nature are, which are in operation in most rivers, tending to the alteration of the level of their beds in various and often unsuspected directions. This question has been opened in consequence of an examination which was made during the summer of last year by Captain Calver, R.N., at the request of the Conservators of the Thames, into the changes which are said to have occurred in the bed of the river since the main drainage scheme was carried out. His attention was also directed to some analyses, made by the late Dr. Letheby and by Dr. Williamson, of samples of the soil taken from the river bed at several points near the main sewer outfalls and Woolwich Reach. The main drainage outfalls were opened into the Thames in 1863-4, since which time the river has been the depository of London sewage. Ten years since, a vessel, whilst passing the southern outfall, went aground upon what proved to be a mud bank 7 feet thick in some places, and which had been formed at a point where it is said there was a gravel bottom with 17 feet of water over it prior to the opening of the outfalls. This led to the institution of periodical surveys by the Conservators, and in his report, recently issued, Captain Calver states that the result has been to show that changes for the worse have of late years occurred in the bed of the river above the outfalls. In 1871 it appears that there had been a progressive accumulation of mud between Battersea and London Bridge, while at various points near the outfalls there has been a diminution in the depth of water. Samples of mud taken from the neighbourhood of the outfalls and from Woolwich Reach were tested by Dr. Williamson, the result being to show a large proportion of sewage contamination. According to Captain Calver, there is in the river a sewage storehouse, or oscillating sewage section, containing 22 days supply of sewage—22 days being the time the sewage would take in flowing down seaward through the 8 miles of distance which intervenes between the upper and lower limits of the sewage sections. This vast mass of polluted water, Captain Calver tells us, is 8 miles long, 750 yards wide, and 4½ feet deep, is charged with offensive matter both fluid and solid, and moves up and down the channel four times daily between Gravesend and near to Blackwall, dropping its solid burden whenever a reduction in the rate of the current or still water may favour deposition. The conclusions at which Captain Calver arrives are, that offensive accretions have been formed in the Thames in the neighbourhood of the metropolitan sewage outfalls, and at other points, these accumulations being due to the deposition of solid sewage matter. He recommends that the Metropolitan Board should be required, at their own expense, to remove these obstructions, both now and in the future, as it would seem they are bound to do by the 20th clause



of the Thames Navigation Act of 1870. In other words, Captain Calver would have the Conservators of the Thames say to the Board of Works, "Gentlemen, when we permitted you to empty your sewage into the river, you undertook that if you made a mess you would clear it up. You have made a big mess, and must, therefore, clear it away as quickly as possible; and mind you keep our river clean for the future."

The answer to this very serious allegation has yet to be given, as the matter is under the careful investigation of the Metropolitan Board. The publication of the report, however, has led to a considerable amount of correspondence in *The Times* upon the subject of sewage utilization—a subject upon which you have all heard and read sufficient during the last few years to justify the suspicion, in my mind, that you would rather I did not reopen the question now. To one letter, however, I must in fairness revert, and that is a communication from Sir Joseph Bazalgette to *The Times* directly Captain Calver's report appeared in that journal. Sir Joseph disposes of several of Captain Calver's theories as to the deposit of sewage matter, and his letter goes to show that the alleged silting up of the river is not only disproved by the facts and figures contained in that report, but that they lead to conclusions precisely the reverse of those arrived at by Captain Calver. For my own part, I have a strong suspicion that much of the shoaling, and the so-called deposit of the solid portion of the sewage, is simply due to the washing away of the mud-banks of the river, and that Captain Calver has committed the error of attributing to the Engineer of the Metropolitan Board the crime of causing a deposit from the sewage of a vastly greater quantity of solid matter than the said sewage ever contained. It is, however, satisfactory to find that this vexed question has been placed by the Board in very competent hands for investigation, and the solution of the problems involved—Mr. Henry Law, C.E., having been instructed to make an independent examination, and to report jointly with Sir Joseph Bazalgette on the subject. And certainly I shall not be surprised to find that Captain Calver has failed to trace the effect to its true cause, and that Sir Joseph will be found to have had the best of the argument.

As to the grounding of a vessel ten years since, Sir Joseph says that a new channel was years ago formed, by dredging at the point in question, on the north side of the river. This resulted, as was expected, in the partial shoaling of the old southern channel, and about ten years since an unfortunate captain, ignorant of the change, took the old channel and touched the ground. An inquiry was instituted before Mr. Robert Rawlinson, who reported that the balance of evidence was against the assertion that the mud had come up from the metropolitan sewage detritus, and that the main channel of the Thames had not been reduced in depth by such detritus.

Another question, which year by year assumes increasing importance, was twice under consideration by the Metropolitan Board of Works last autumn. This question is the recurrence of floods within the metropolitan area, and which has at length become a public scandal. Last year the matter formed the subject of inquiry in the House of Commons, when the Board introduced a Bill for giving to, or, rather, imposing upon, Vestries and District Boards additional powers for executing works to keep the river within proper bounds. The opinion of Parliament, however, was that the prevention of floods was a part of the general management of metropolitan affairs, and not a local duty to be laid upon Vestries. The proposals of the Board, consequently, fell through. The Vestries have, of course, taken no active preventive measures, and we may possibly have a renewal of those scenes of distress and destruction which have repeatedly occurred in Lambeth, and elsewhere along the low-lying riverside districts. In fact, we have, to a certain extent, had a repetition of these calamities on a small scale, and but for the occurrence of favourable winds during more than one high tide of late, the results might have been very disastrous. The question was discussed by the Board early in November last, when a strong opinion was expressed by the representatives of the Lambeth division, that the Board ought to deal with the matter. On the other hand, it was contended that it was clearly within the province of the Vestries to prevent the recurrence of these disasters. Then it was proposed that a case should be stated, and an appeal made to the Courts of Law for a judgment defining the duties of Vestries and District Boards under the Metropolis Local Management Act, in respect of the prevention of floods. The proposition, however, fell through, as did also that for authorizing the Board to undertake the task of keeping out the flood waters. Here, then, the matter rests for the present; the Board will neither undertake to act itself, nor to coerce the Vestries into acting. It would seem pretty clear that it is the duty of the Board, as the governing body, to deal with the matter, and, in my judgment, it would be well if they yielded to the voice of that section of their body which seeks to impel them in the path of duty, backed as the opinion of that section is by that of the House of Commons. The prevention of floods requires systematic treatment; a few spasmodic and wasteful efforts here and there can do no good. The matter should, therefore, not be left in the hands of local bodies, but be placed directly under the control of the Metropolitan Administrative Authority. I observe it stated in the public journals to-day that the Metropolitan Board are about to take action in this matter, by applying to Parliament during the present session for powers to meet this new emergency.

It will thus be seen that our ancient river, formerly "the silvery Thames," has in one way or another been unconsciously occasioning a considerable amount of trouble of late. Before quitting its much-maligned shores, however, there is one other subject which demands a passing remark from me. That subject is the inadequacy of the bridge accommodation at the East end of London to the ever-increasing requirements of traffic. It has been felt for many years past that London Bridge was wholly inadequate to meet the demands of traffic, and, for years past, almost numberless schemes have been proposed for bridges of all kinds near the Tower. This want led to the conception and carrying out of the Thames Steam Ferry at Rotherhithe, by means of which the transport of laden waggons with their horses across the river was to be effected. During the progress of these works our members visited them, and most interesting the visit proved. Since then—namely, on the 31st of October last—the ferry was opened, and answered its purpose remarkably well, and was extensively used, until an accident occurred to the machinery by the breaking of a chain. This led to a suspension of working for the necessary repairs, which it is expected will be completed very shortly, when the traffic of the ferry will be resumed. Admirable as this method of dealing with the difficulty is in itself, it does not wholly meet the case. Night and darkness and foggy days must ever cause stoppages in this method of transport. Hence the desirability of a bridge which shall aid the traffic without interfering with the navigation of the river. Such a bridge exists at Newcastle, across the busy Tyne, and meets every requirement. Such a bridge could, of course, be easily built across the Thames. There are two Bills in Parliament this session for bridges over the Thames. The City Special Bridge Committee have selected a site for a low-level bridge, although they do not appear to have taken any steps to secure it for their intended purpose. On the other hand, the Corporation are applying to Parliament for powers to widen the parapets of London Bridge 11 feet on either side, at a cost of from £75,000 to £100,000—a piece of vandalism which I trust will never be carried out, except by taking down bodily the present masonry facings of the bridge

from the present fronts, and rebuilding them at the required distance, filling in the intervening space with new masonry. But, widen the bridge how they may, I fail to see the benefit until the immediate approach at the north end be widened also, so as to allow the traffic from the seven converging thoroughfares free access on to the bridge. However, this question will doubtless be well sifted before a Parliamentary Committee during the present session.

Our Legislative Assembly will, probably, hear a great deal more about water supply than will be afforded even by the big scheme of the Metropolitan Board of Works for the supply of London. Manchester appears to want a supply of pure water, and it is proposed to afford it this luxury by tapping Lake Thirlmere. This is objected to by some, and there has been a newspaper fight over the scheme already; so what may we not expect in the House, with a bishop on either side as champion? The contest will rage between the Corporation of Manchester and the lovers of Thirlmere. On the one hand, we shall have the necessities of the working population urged, and, on the other, the claims of natural beauty. It will be a case of the free development of municipal government *versus* the sanctity of the tarns and dales that rest under the shadow of Helvellyn. What would poor Wordsworth say if he could speak now? Little did he dream when he wrote:—

"How bless'd, delicious scene, the eye that greets  
Thy open beauties or thy lone retreats;  
The unwearied sweep of wood thy cliffs that scales;  
The never-ending waters of thy vales!"—

that busy Manchester would ever seek to send an army of navvies to effect, in that lovely region, such a transformation as is proposed. It is, however, whispered that the "necessities of a labouring population," to which I have alluded, are more fancied than real, and that the water is to be taken not for sanitary and domestic purposes, but for manufactures. The conflict would by this appear to be narrowed to certain Manchester traders on one side, and widened to the people of England generally on the other. It has been surmised by one writer on the subject that, should the Manchester folks win the day, there will be more factories in their city, and it will be dirtier, not cleaner, than before, and its labouring population will gain increase, not of necessary water, but of superfluous smoke.

Liverpool next comes before us as a "dry and thirsty land," from whence emanates a proposition to obtain a supply of water. The proposal here is to take it from one of the sources of the Severn, the upper part of the River Verniew, in Montgomeryshire, at a point where it is 817 feet above the sea. There the river flows through a deep and narrow valley, which the Engineer to the Liverpool Corporation proposes to convert into a lake about five miles long by one mile wide, a dam at the foot being raised 75 feet above the bed of the stream. To do this, the hamlet of Llanwddyn, consisting of a small church, and some 35 cottages, of a rateable value of £73, as well as a few scattered cottages outside the hamlet, will have to be submerged. It is stated that the scheme will increase the supply of water in the Verniew in the summer, diminish the floods, and improve the salmon spawning-ground. The cost of bringing 13 million gallons of water per day from this proposed reservoir to Liverpool is estimated at £1,280,664. In addition to this supply, it is proposed to take a further quantity from two of the lower tributaries—namely, the Cowny and the Marchant. It is probable that the necessary surveys will be made, and Parliament applied to for authority to carry out the works.

Before taking leave of sanitary matters, I think it right to bring under your notice two important measures affecting the drainage of the Thames Valley, and which have come under my notice during the past year. The first is the West Kent main drainage works, which are now in an advanced stage of construction. The Metropolitan main drainage works being of a sufficient capacity only for dealing with the sewage of the metropolitan area of 117 square miles, the outlying districts have to take care of themselves. The West Kent main sewerage scheme, of which Sir Joseph Bazalgette is the Engineer, consists of a main line of intercepting sewer 15 miles in length. It commences at Beckenham, on the confines of the parish of Croydon, and passes through various towns on its way to Dartford Marshes, where it has an outfall, the sewage flowing into the Thames at Long Reach. A branch sewer commences at Orpington, and is carried through the Cray Valley to Bexley, where it forms a junction with the main sewer. The sewer is being constructed in Portland cement concrete. The works were practically commenced in the beginning of last year, and during the year good progress was made both with the sewer and the outfall works, which include a concrete reservoir or settling-tank, 500 feet long and 120 feet wide. The whole works are expected to be completed by the end of the present year.

The second measure to which I would direct your attention relates to the higher portion of the Thames Valley, and affects the districts of Kingston, Richmond, and surrounding places. For the past ten years there has been a constant struggle going on with respect to the disposal of the sewage of those districts. An Act of Parliament passed in 1867 prohibited the discharge of sewage into the river, under heavy penalties. From that time to the present, however, the sewage has never ceased to flow, and the penalties incurred by the various riparian parishes now amount to hundreds of thousands of pounds. The mistake was, that the Legislature, in imposing the restriction, did not—probably because it could not—indicate a way of escape. I need hardly say that, inasmuch as the various parishes have been trying ever since to remedy the evil, each in its own little way, the fines have never been demanded. In fact, the whole thing is treated as a joke, and, were it to be treated otherwise by the Government, the districts in question would have to be sequestered. At length, however, the various parishes were combined into one district for sewerage purposes, and an Act was passed just at the close of last session authorizing the construction of a sewer for the use of all the constituent parishes. There will be no difficulty in getting rid of the sewage when once the intercepting conduit is constructed, inasmuch as Sir Joseph Bazalgette, with creditable foresight, has anticipated the requirements of the district in question by making the main sewer and works of the West Kent drainage system of sufficient capacity to accommodate the higher district. It will be an easy matter to conduct the Kingston sewage to Beckenham, whence it will flow away to the outfall at Dartford Marshes.

The history and adventures of Cleopatra's Needle were then summarized by the President, who expressed his regret that it was not to find a location in that most appropriate place, Parliament Square. But wherever it is placed, said Mr. Spice, the obelisk will remind us of an age distant in every way from our own. It was not in the days of free labour that that massive column was hewn from the solid rock and dragged to its first station, and when that work was performed there were no trades unions, no strikes, no mutiny against long hours of labour, nor any "grandmotherly" legislation. In those days there were no parliamentary quacks seeking to gain popularity by advocating combinations of labour against capital, to make manufactures as dear as possible, so as to drive customers from one country to some other where such folly has not taken root, but where natural laws prevail to the benefit of all classes alike.

The President having described the telephone and the phonograph, proceeded to place before his audience particulars respecting the most recent applications of electricity as regarded illumination, gas lighting, and photography. He said:

During the past year the practical application of electricity has advanced



in more than one direction. As a source of light it has been utilized to a certain extent on a working scale by M. Jablochhoff, and an exhibition of the light was given in London last summer. M. Jablochhoff uses a powerful magneto-electric machine, producing alternating currents of positive and negative electricity, and from it a wire is led to a number of points, at each of which the light is to be produced, the wire being returned from the last light in the series back to the machine. At each point where the light is produced is what M. Jablochhoff calls an electric candle, which is composed of two carbon pencils, each about 4 inches long, and connected together, side by side, by a strip of kaolin, which burns at the same rate as the carbon points. The current of electricity passes up and through one carbon point, becomes utilized as light at the top, and passes down the other carbon, and so through the wire to the next candle. So far as the experimental trial was concerned, all was satisfactory. There are, however, several defects in the system which must be remedied before the invention can take its place as one of general practical utility.

The application of the electric light to photographic purposes has been successfully accomplished by Mr. Van der Weyde, an American artist, whose paintings have found a place upon the line at the Exhibition of the Royal Academy. Mr. Van der Weyde studied the subject thoroughly for two years, at the end of which time he had perfected a method of taking photographic portraits, by the aid of the electric light, which are perfect specimens of the art. He uses a dynamo-electric machine, and utilizes the light in a reflecting apparatus of special construction, by means of which the person or object to be photographed is flooded by a convergent beam of pleasant soft white light, which does not affect the eyes of the sitter in the least. The new arrangement of light is found to be equally as applicable to the printing of negatives as to the taking of them.

The next practical application of electricity for our notice is that which has been made by Mr. St. George Lane Fox, who has invented apparatus for turning on, lighting, and turning off any number of gas-lamps simultaneously by means of electricity. The system has been at work most successfully during the past year on some 40 lamps at the station of The Gaslight and Coke Company at Fulham. The lamps are connected together by insulated conductors, and by means of a current of electricity sent through a small fixed electro-magnet, a reciprocating magnet is moved on its axis, and the gas is turned on. A discharge of electricity from a condenser is caused to ignite the gas at every lamp at the same moment, whilst a reverse current of electricity from the battery reverses the action of the magnets, and turns it off. It is stated that a very large saving would accrue to the Vestries and Local Boards if this system of lamp-lighting were adopted, and, as Mr. Fox is negotiating the matter with several of these authorities, we may possibly hear something more of the matter shortly. Mr. M'Minn, the Engineer to The Gaslight and Coke Company at the Fulham station, has reported very favourably upon the working of the system.

The President then referred to railway working, pointing out how rapidly the adoption of the Westinghouse continuous brake was extending, and describing Mr. Hodgson's ingenious invention for uniting the block and the interlocking systems in one, and which had been adopted by the Brighton Railway Company. The liquefaction of oxygen and other gases by M. Pictet and M. Cailletet, the new system of quadruplex telegraphy, the recent advance made in gunnery, the question of compound armour plates, Sir William Thompson's recent inventions, and various other interesting subjects, were touched upon by the President, who, in conclusion, regretted that time did not permit him to enter more largely into details upon several of the subjects.

The Address was well received by an appreciative audience, and at its close a cordial vote of thanks was accorded to the President.

#### SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Annual General Meeting of the Members of this Association was held at the Bedford Hotel, Southampton Row, London, on Thursday, Feb. 14. The chair was taken by Mr. A. H. Wood, the outgoing President, to whom a very hearty vote of thanks was given for the services rendered by him to the Association during the past two years of its infancy.

It was then moved, seconded, and resolved unanimously, that Mr. James Eldridge, of Richmond, be elected President of the Association for the present year.

The other officers were also duly elected.

Three new members—viz., Mr. C. W. Hastings, London; Mr. D. R. Marden, Uxbridge; Mr. D. F. Goddard, Ipswich—were admitted.

The following is the list of Officers and Members:—

##### President.

James Eldridge, Richmond.

##### Treasurer.

Alfred H. Wood, Hastings.

##### Hon. Secretary.

J. L. Chapman, Harrow-on-the-Hill.

##### Committee.

Brett, R. W., Hertford.

Broadberry, W. H., Tottenham.

Farrand, C., Croydon.

Hunter, Jno., Woolwich.

Packham, H.F., Kingston-on-Thames.

West, Jno., Maidstone.

##### Auditors.

Botley, C. E., Wormwood Scrubs.

Price, E., Hampton Wick.

##### Members.

Baker, E., Reading.

Broadberry, W. F., Southend.

Brown, Allen, Woodford.

Chapman, Jno., Great Stanmore.

Cooper, W. R., Banbury.

Cotton, E., Uxbridge.

Farrand, F., Aeton.

Gandon, C., Sydenham.

Goddard, D. F., Ipswich.

Good, R., Carlisle.

Green, B., Mitcham.

Hammond, Jno., Lewes.

Hastings, C. W., London.

Marden, D. R., Uxbridge.

Martin, T. H., Barnet.

May, T., Canterbury.

Mitchell, H. J., Hornsey.

Morton, J., Ashford, Kent.

Parlby, W., Sheffield.

Phillips, A. F., St. Albans.

Richmond, Jno., Worthing.

Scott, G., Tunbridge Wells.

Sheppard, R., Horsham.

Townsend, Harry, Waltham.

Valon, W. A., Ramsgate.

Wadeson, J., Windsor.

Webb, T., Egham.

Wilson, A. F., Aldershot.

Wilton, Jno., Silvertown.

Woodall, C., Kennington Lane.

Wright, W., Blackrock, Brighton.

our friend, Mr. Wood, during the first two years of our existence, and I am sure I may also add, to our having, in our friend, Mr. Chapman, so able and indefatigable an Honorary Secretary. These and similar Associations are the offspring of the British Association of Gas Managers. I am sure we should all much regret if the parent should be seriously uneasy at having rather a numerous family springing up in different parts of the country. Is there any ground for that uneasiness? Mr. Wood said in his first address, "That nothing would have induced him to have given even the semblance of support to anything that would not run side by side with the parent society." I should like to say that, if I thought my being a member of this Association, or in any way promoting its interest, was injurious to the parent Association, I would at once withdraw from it, and use any little influence I might possess to help to put it down. I mention this because I have heard a considerable amount of anxiety expressed by those whose opinions are entitled to the highest respect.

I suppose we all look forward to our annual gathering with interest and pleasure, knowing we shall listen to able papers and interesting discussions, and to the friendly intercourse with those whom we meet only on these occasions; but then it would not be possible for us at our great gathering to do as we can at our nice little quarterly meetings.

In the great meeting, the speaking, as a rule (not only from the want of time, but from want of nerve), is confined to a very few members. In these small gatherings we seldom separate without almost every one present having made some remark on the subject before the meeting, and that with the most perfect ease, feeling it to be like a family party. This would be quite impossible at our great annual gathering. I have dwelt a little on this, because I am sure we wish it to be quite understood what are our objects and desires. I hope that during the present year we may continue our pleasant interchange of ideas on matters so important to us.

If agreeable to the members, I should like the following subjects, among others, to be again discussed during the year—viz.: The Jet Exhauster; Public Lighting; Scrubbers and Washers; and Payment of Managers, &c., by Results.

I think you will agree with me that the interesting paper read at our last meeting on "The Jet Exhauster," by Mr. Brett, deserves more discussion, as it is a matter of great moment to gas makers. There is something so singular in the very idea that our steam-engines and exhausters can remain quietly at rest, the steam alone doing the work without them, that we all hope it may prove a success. Notwithstanding how much we must all desire such a result, I must confess that Mr. Brett's paper, with the discussion that followed, did not raise my hopes so high as I expected, and I think the results that he mentioned were scarcely what had been anticipated. Perhaps the subject may be resumed to-day.

With regard to the question of public lamps, I suppose it will be considered almost a settled question that the average meter system is the right one. When most of our great gas engineers, and the JOURNAL OF GAS LIGHTING, have so decided, and when so many public bodies have adopted it, and seem tolerably well satisfied, it seems almost presumptuous to have a second thought on the matter. Still, I think that the real question is this: Is it really right that gas, under any circumstances, should be sold without measurement? Local bodies should have gas at the lowest possible price, and, at the same time, no more nor less than they pay for. Does the average meter principle secure such a result? Let us suppose a town with about 500 lamps, having bought and fixed 50 meters—i.e., one in ten—with all the necessary regulators, &c., and they are to light, extinguish, repair, &c., all the lamps. They begin with their staff of lamp-lighters, under the superintendence and management of their own surveyor or agent appointed for that purpose. It must be borne in mind that the great probability is, this gentleman's emolument, and, perhaps, his very position, depend upon his bringing down, and keeping down, the gas-rate. If he fails, he will give offence to those members of the Local Authority who lose no opportunity to find fault with the Gas Company.

It is to be expected that the lamp-lighters will frequently hear such remarks as, "Don't you be in such a hurry to light those metered lamps. It was too soon last night; keep them down a bit." The Surveyor feels he must show a result for all this expenditure. Is there not, then, a probability that, in some cases at least, the Company will suffer? But, suppose the Company find all lamps, meters, &c., and light and extinguish, and they send round their staff of lamp-lighters, will you not sometimes catch the Company's Inspector saying to his men, "You were late with those metered lamps last night, and too early this morning?" He will be desirous, in the interests of his Company, to swell the gas account. Whether he is so or not, those gentlemen to whom I alluded just now, connected with the Local Board, will assert that the Gas Company do not do them justice.

But there is another view of this question which I have never heard taken into consideration, and that is the great waste of gas in the public lamps, whether by average meter or otherwise. As a rule, when lamps are burned all night throughout the year, they consume about 20,000 cubic feet. Now, if the whole of the gas was consumed by meter, and the parish authorities put on exactly the same footing as private consumers, I believe they might at least save from 5000 to 6000 cubic feet per lamp per annum. In many places, where a large flaring light is consuming, perhaps, from six to seven cubic feet per hour, one consuming half the quantity would do as well. In summer seasons and moonlight nights many of them might be put out at midnight, or every alternate one left unlighted. A clever Surveyor, with judgment, would have no difficulty, by a variety of ways, in saving from 5000 to 6000 cubic feet per lamp per annum, without producing any inconvenience to the public. This would be equal to £1 per lamp, at the rate of 4s. per 1000; and suppose the meter to each lamp to cost the parish at the rate of 10s. per annum, either by purchasing them or in the shape of meter-rent to the Company, the Ratepayers would save 10s. per lamp, or equal to £250 per annum; but, above all, the great advantage of this system is that it is equitable, and must almost, if not entirely, put an end to the now never-ending squabbles between the Local Parliament and the Board of Directors. It is universally admitted that the old contract system to private consumers was wrong, and ruinous to the Companies, and that measuring the whole of the gas consumed is right, and the only right way; and, if meters have been made that are suitable for public lamps, and can easily be fixed to one in ten, could they not be fixed to the other nine? Suppose they do cost £7, if the Company let them to the parish at 10s. per annum, that is not a very bad return. I wish some of our members would write a paper on the question, as to the best mode of so arranging that all gas sold should be measured.

I should like now to say a few words on the subject of paying Gas Managers and other officers of the Company by results. This is now becoming a very frequent topic amongst persons connected with gas undertakings. You will remember that Mr. Wood spoke of it in his opening address of last year. He said four ways had been suggested as a basis upon which this might be done—viz., either the quantity of coal carbonized, the dividend paid, the quantity of gas made, or the quantity of gas brought to charge. He considered the last one the best, but confessed that neither was quite satisfactory, because there might be circumstances, under either of these heads, over which the Manager could have no control.

The ordinary business being concluded, The President (Mr. Eldridge) delivered the following Address:—  
Gentlemen,—When at our meeting in November you so kindly elected me to my present position (and for which I desire most sincerely to thank you), I then felt, and still feel, you ought to have chosen some one of greater experience and higher standing in the gas world. I know I shall receive every kindness from you, and can only hope that our young Association will not suffer from any inefficiency on my part.  
I think it is a matter for congratulation that we have now 43 members. I am quite convinced, and I am sure you are of the same opinion, that very much of our success is owing to our having had so able a President in



My opinion is that the most equitable and the most encouraging way would be to pay according to profits realized, as shown in the balance-sheet at the end of the year.

If this plan could be adopted, I should like to see it extended to some *employés* as well as the Manager. After all, it is the profit realized at the end of the year's working that is the true test of a Company's prosperity, as well as the perseverance, faithfulness, and judgment of the Manager; but the Manager is dependent upon those who are acting with him in all the departments of manufacture and distribution, and if we could only make those *employés* feel that their interest was bound up with the general interest of the Company, it must give a greater stimulus to the more faithful discharge of their several duties, and each one would feel he was in a certain sense a partner in the concern. I would give the two head stokers more in proportion than others, as they are important persons in works of the size I have described. By their care and watchfulness (especially in the night) they can greatly contribute to a Company's prosperity, and the reverse is the case if they are careless, feel but little interest in their work, are unconcerned about heats, stopped pipes, or leaky retorts, or waste of gas consumed on the works, and many other ways. If you can once bring them to feel that their interest is at stake in these things, you have done a good deal towards promoting the general interests of the Company. Gentlemen, I give this as a sort of rough outline of what I think would be a judicious way of paying by results. I feel quite certain it would not be prudent nor just to confine it to the Manager.

If I am not trespassing too much on your time, I will very briefly allude to two other subjects. The first is rotary scrubbers. At almost all meetings of gas men the subject of scrubbers and washers is alluded to or discussed. I have always considered the Coffey still the best of all, and I can hardly say too much in its praise, so far as our works are concerned. But there is just now a great stir about rotary scrubbers or washers. Mr. Hulett has brought out what, no doubt, is an excellent one. As far as I can learn, Mr. Paddon was the first to invent and work them; and all that have followed have been more or less due to this latter gentleman's original idea. I think they are worthy of consideration. I should like to lay before you a drawing of one which I have thought out. It exists only on the piece of paper before you, and most likely will not go beyond that stage.

It consists of a cast-iron tank domed on top, 24 feet long by 6 feet wide and 6 feet high, having two transverse plates jointed to the side and bottom plates, forming three compartments.

The first one should be charged with strong liquor, the second with liquor much weaker, and the third with water. When the first is sufficiently strong, it is to be drawn off and used in the manufacture of sulphate of ammonia; and then that in the second compartment is to be brought forward into the first, to be worked up to the same strength as that which has been drawn out. The water in the third compartment, which will contain some small quantity of ammonia, may be brought forward into the second compartment, and be worked up to sufficient strength for making sulphate of ammonia, or if not considered desirable to bring the water forward, an arrangement might be made by which a little stream of clean water might be kept continually running in and out of No. 3 compartment, so as to ensure all traces of ammonia being taken out. This change of liquor is done by means of arrangement of taps and pipes, as shown.

The interior of the tank is fitted with revolving wood discs. These are formed of a cross framing and outer rim of 3 inch by 2 inch timber. The interior space is filled up with parallel wooden bars placed in such a manner as to present the greatest water surface to the gas passing through. These bars may be readily made in the same manner as ordinary purifier grids. A square shaft, working in bearings fitted to the end plates, and also in bearings fitted to the transverse division plates, carry these revolving discs, which are fitted to the shaft in such a way that the parallel wood bars are never opposite each other, but always at an angle of 45°, thus ensuring a more perfect division and breaking up of the gas.

A rigger is keyed on to the end of the shafting on the outside of the tank, to communicate the motive power. The gas openings are wider in that part of the apparatus next the foul inlet, and decrease in width as it approaches the outlet.

The scrubber is estimated to be capable of passing about 1½ millions per 24 hours, and has the following advantages, viz.:—

1. The clear gas-way is equal to eight times the area of the inlet-main.
2. The wetted surface exposed to the action of the gas is equal to 1000 superficial feet. Taking the make of gas at 60,000 feet per hour, and the wood discs to be making 10 revolutions per minute, this would give an area of 10 superficial feet of wet surface contact to each cubic foot of gas passing.
3. It would give a merely nominal back pressure, and by adding to the speed of the revolving discs, almost any surface area of water contact might be obtained.
4. In each revolution the whole of the ammonia absorbed by the wet surface of the revolving discs is washed off by the liquor in the tank by its immersion in it.
5. The apparatus is extremely simple, requiring no complicated and expensive machinery; there is little likelihood of it getting out of repair, and it could be made at a very moderate cost.

There is one more subject, gentlemen, about which I suppose I shall be expected to say a few words—i.e., "West's Stoker."

After another six months experience, I am of the same opinion as when I read my paper at Bristol. I may just mention that since that time our make of gas has considerably increased, while at the same time there has been a great reduction in the stokers' wages.

I thank you for the attention with which you have listened to my remarks.

The Ex-PRESIDENT (Mr. Wood) proposed, and Mr. BAKER seconded, that a vote of thanks be given to Mr. Eldridge for his address, and that he be asked to allow it to be printed and circulated among the members, which was carried unanimously.

**RAWFOLD WATER COMPANY, LIMITED.**—A meeting of the Shareholders of this Company was held at Cleckheaton, on the 11th inst., when it was resolved that a dividend of 14 per cent. per annum be paid to the Shareholders. The shares were originally £1 each, and an offer has been made by the Liversedge Local Board for the purchase of the Company's plant at £1 15s. per share, which has been refused. The previous dividend paid by the Company was £14 10s. per cent. per annum.

**HULL WATER SUPPLY.**—The Engineer of the Corporation Water-Works (Mr. Maxwell), in his last report, quotes, as bearing on the water supply, the following from Mr. Harold Smith's tables of the rainfall of Hull:—The average rainfall during the last 20 years was 25·65 inches. The average of the two years, 1873-74, was 21·14 inches, or 17·6 per cent. under the average. The average of the three years, 1875-77, was 29·66 inches, or 15·6 per cent. above the average. In other words, the average rainfall of the last three years had been 10·3 per cent. above that of the previous two years.

#### GAS-FITTINGS ON HIRE.

The Directors of the Sheppy Gas Company have introduced a new feature into their plans of operation, which, we think, might be advantageously extended—viz., the supply of gas-fittings on hire, on the "three years system" of hire and purchase.

From a circular which they have issued to their consumers we make the following extracts, which may be of use in other localities in which it may be desired to adopt the plan:—

"The Directors believe that, from its cheapness and comfort, the use of gas in ordinary dwelling-houses would be much more generally adopted, if it were not for the first expense of providing fittings, and the inconvenience of their removal in case of change of residence. To obviate this difficulty, they provide all the necessary fittings in private houses at a small quarterly rent, giving the consumer the option of purchase, at any time, at a fixed price. Half the amount paid for hire is deducted from the original price if the fittings are subsequently purchased.

"If the fittings are not retained in use for *twelve months*, a charge for labour in fitting and removing will be made.

"In hired houses, as a protection to the property of the Company, a consent from the owner to permit the fixing and removal of the gas-fittings will be required. A printed form for signature by the owner, or his agent, is provided by the Company.

"The charge for the hire of meters is for 2 lights, 6d.; 3-lights, 9d.; and 5 lights 1s. per quarter.

"The cost of fittings for 2 lights, one in each ground-floor room, is about 30s., according to the description of gas-fittings required.

"The charge for the hire of fittings of the purchasing value not exceeding £1 10s., is 9d. per quarter; £2 value, 1s. per quarter; and so on, at the rate of 6d. per quarter for every £1 selling value; or—

"Subject to exceptional circumstances, the charge for the hire of fittings for 2 lights will be 9d. per quarter, increased by 3d. per quarter for every additional light.

"In cases where fittings are required for shorter periods than one year, special rates of hire will be given.

"Globes and shades are not supplied on hire; these are charged for, if required, at 1s. each and upwards.

"No charge will be made for repair of fittings on hire, except in cases of breakage or damage other than ordinary wear.

"Since the introduction of this system, in 1867, over 250 houses in Sheerness have been fitted up on hire, and the number is constantly increasing.

"As a guide to those unacquainted with the usual cost of burning gas, it may be stated that the burning of one light will, with proper precaution against waste, cost about £1 10s. for the year, or about 1d. per night, summer with winter. *This must not, however, be taken as indicating a fixed price, as the cost is solely regulated by the size of the light used, and the number of hours it is burned.* The price above given is only instanced as that which will, with care, and under ordinary circumstances, afford a light many times superior to that to be had either from candles or oil; beside, in winter time, effecting a great saving of fuel for warming purposes.

#### "The 'Three Years System' of Hire and Purchase.

"By the ordinary system, owing to the small charge for hire, the fittings must be in use about 20 years before they become the actual property of the hirer. As it is found that many consumers would prefer purchasing their gas-fittings within a shorter period, the Company are prepared to supply fittings of the same kind as those usually provided on hire, to be paid for in *three years*, by twelve equal quarterly payments, thus:

Fittings, value £1 10s.,	twelve payments of 2s. 6d. per quarter
" £2 0s.,	" " 3s. 4d. "
" £2 10s.,	" " 4s. 2d. "
" £3 0s.,	" " 5s. 0d. "

And so on in proportion.

"These fittings, it must be understood, remain the property of the Company until the twelve payments are completed, but if returned to, or removed by the Company in good condition, at any time after six quarterly payments have been made, one-half of the amount of such payments will be returned. In all other respects the ordinary conditions on which fittings are supplied on hire will apply to those provided on the 'three years system.'

"Consumers who now hire fittings on the old terms may purchase them on the 'three years system,' at the original value, less one-half the hire previously paid by them.

"A pamphlet illustrating the economy, cleanliness, and safety of the use of gas in all classes of dwellings, is to be had gratis, on application at the office; also any further information required respecting the hire of gas-fittings, &c.

"Gas cooking-stoves of improved construction, for baking, roasting, boiling, &c., are supplied and fixed on hire, at the rate of 6s. per annum and upwards, according to size, &c."

#### THE GAS-BURNER MAN.

Upon almost every day in the week my *sanctum sanctorum* is invaded by some individual anxious to display a new toy, an invention for growing potatoes without soil, or some equally desirable invention, which he is willing to dispose of for a mere matter of money—money paid upon the spot. Oftentimes the obtrusive stranger belongs to the gentler sex, and I have frequently to seize my hat, and after boldly, and yet sinfully, departing from my usual path of truth, to rush forth and await the exhaustion of my visitor's patience. It is indeed no exaggeration when I say that for two mortal hours I have beat a tattoo with my impatient feet (and during that length of time have certainly not improved my reputation for the possession of an equable temperament) ere a lady in decent black would come forth and allow me to return in peace. Even when this desirable result was attained, I found that an inkstand and an ivory paper-knife (the gift of an admiring damsel) had taken their departure with the soft-spoken lady who called to direct my attention to a new work upon the higher education of women in Dahomey (to be produced, I believe, in monthly numbers at half-a-crown per copy). Of these callers the name is legion, but upon my honour the man who "begged to introduce a new and most improved gas-burner" to my notice surpassed all his predecessors in his mode of attack, his imperturbability, and his unflinching politeness under what must have proved the most trying conditions. I was soothing my somewhat exhausted mind with a most admirable leading article upon the Conservative party, and thinking that it was well-nigh time to go forth in search of luncheon. At this juncture a clerk entered my room, and, handing me a card, announced that a gentleman wished to see me concerning the gas supply. That supply of late had certainly been intermittent, and I directed that the visitor should be introduced. A tall, fine-looking man entered, and, depositing his hat and a small bag upon the nearest chair, stood and bowed. Desiring him to take a seat, I proceeded without any questioning to acquaint him with the state of affairs, and after talking for some ten minutes, inquired if he was prepared to suggest a remedy.

"Most decidedly, my dear sir," (I do object to be called "My dear sir")—he replied, with a smile. "I have here" (and he proceeded to open the



bag) "an article which will most effectually remedy the evil you complain of. It is an improved burner, and I will fix it upon one of your jets to demonstrate the fact."

I thought that he represented the most obliging Gas Company that I had ever heard of, and congratulated myself upon being one of their customers, or clients, as my visitor would have termed them. Though a most gentlemanly man, he was also a quick workman, and in a minute or two, the old burner had been removed, and the "improved article" adjusted. My friend stood with his tools in his hand, and gently moving his dexter hand towards the burner, in a manner that would have made the fortune of a dancing master or a conjuror, desired that I should apply a light to the jet. I did so, and the flame was a most brilliant one.

"There, my dear sir," ("My dear sir" again; I was beginning to feel suspicious of my affable friend), "don't you consider that a decided improvement?"

"Certainly," I replied; "and I shall be glad to know the name of the makers, in order that, after a fair trial, I may order more."

He opened the bag again, and with another sweet smile (my suspicions increased), handed me a prospectus of the New Gas-Burner Company. I thanked him, and after wishing him good-day, took up my newspaper.

"You will excuse me, my dear sir," (I now saw that I had been trapped) "but I shall be glad to receive the trifling sum of 2s. 6d. for the burner that I have fixed, and with which you have expressed your entire satisfaction."

It is needless to relate how my patience was fairly exhausted, my good temper entirely a matter of the past, and that the affable stranger bowed and smiled in response to my excited language and wild demonstration; also perfectly unnecessary to say that he obtained the sum demanded, and went upon his way to ensnare other victims. As the beggar said to Voltaire, "A poor devil must live."—*Pictorial World*.

#### IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There has again been very little change of importance during the week in respect of iron prices, but in regard to the wages of the ironworkers, arrangements have been made which should prove of the greatest value to the ironmasters. At all the principal local works of this class, the puddlers and tonnage men have accepted a further reduction of  $7\frac{1}{2}$  per cent., making a total reduction of 12½ per cent. since the commencement of the year 1878. By this further drop, puddlers wages are lowered to 7s. 6d. and 7s. 9d. per ton, whereby this part of the first cost is thus put on the same level as in South Staffordshire and the other ironmaking districts. It is, of course, yet too early to see what the result of this step may be, but it ought to be of much value to the ironmasters, and may reasonably be expected to aid them most materially in competing for the orders of the day. In this immediate locality, however, there is no briskness in any single branch, although at one establishment, where a good deal of merchant iron is made, I hear that the men have been placed on a couple of additional "turns" per week. The pig iron agents complain bitterly of the small transactions now current, and are naturally leaving no stone unturned for the purpose of securing orders. General brands of North Yorkshire pigs are now quoted as follows:—No. 1 foundry, 44s.; No. 2 foundry, 42s. 6d.; No. 3 foundry, 40s. 6d.; No. 4 foundry, 39s. 6d.; No. 4 forge, 39s.; mottled, 38s. 6d.; white, 37s. 6d.; refined metal, 57s.; Kentledge, 42s. 6d.; and cinder pig, 35s. 6d.; all net cash. South Yorkshire, Derbyshire, and North Lincolnshire pigs are for the most part unchanged.

The coal market is quiet, and several kinds of house coal have been lowered to the extent of 6d. per ton during the week. In steam coal, some of the continental buyers are disposed to enter into contracts for early spring shipments from Hull, Grimsby, and Goole, to the Baltic and other northern ports, at prices ranging from 5s. 6d. for ordinary, up to 8s. 6d. for best qualities of this fuel. A few continental gas contracts are also talked about, but in many cases the South Wales firms appear to be "having all their own way." Coke is nominally 12s. 6d. to 13s. 6d., and gas coke 8s. 6d. to 11s. 6d. per ton.

#### THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is a gradual dropping off in the demand for all descriptions of coal in this district, and with it a good deal of pressure on the part of consumers to secure concessions; but, although there is a downward tendency in prices, so far as the ordinary quotations at the pit mouth are concerned, there is no material change to notice. There is, however, a keen competition for orders, and in the inferior classes of fuel, prices, as a rule, are a matter of arrangement between buyers and sellers, independent of list rates. There is still a fair demand for the better classes of round coal, and some of the collieries continue tolerably well supplied with orders; but it is not probable that any activity will now be maintained for long, and colliery proprietors are looking forward to a very quiet trade, as any prospect of improvement in the staple industries of this district seems to be as remote as ever. There are some considerable local inquiries for gas coal, for deliveries extending over the next two or three years; but whether colliery proprietors will be disposed to contract so long forward at anything like the present prices, I should think is very doubtful. For the better classes of round coal at the pit mouth, quotations remain at 10s. to 11s. per ton; for best Wigan Arley, 8s. to 9s.; for common ditto, 8s. to 8s. 6d.; for Pemberton four-feet, and for the common Wigan mines suitable for house-fire purposes, about 6s. 6d. to 7s. per ton is quoted. Common coal for steam and forge purposes, which is very difficult to move, ranges from 5s. 6d. to 6s. 6d. per ton, according to quality; burgy from 4s. 6d. to 5s. 3d.; and good slack from 3s. to 4s. per ton, with very common sorts offering at less than 2s. 6d. per ton at the pit.

There is no material change in the shipping trade, which continues extremely dull, with exceedingly low prices ruling in the market.

In the iron trade business continues extremely quiet, and the local producers of common iron, being unable to compete with the low prices at which outside brands are offered in this district, are securing very few orders, but they still hold for late rates. For finished iron there is also only a very small demand, and although the market quotations nominally are without change, bars are offered by some of the local makers at very low figures, and for good specifications can be bought, delivered into the Manchester district, at less than £6 5s. per ton.

The finished iron makers, after another meeting, have decided to follow the reductions in wages which I announced last week, by a further reduction of  $2\frac{1}{2}$  per cent. in May next, making a total of 12½ per cent.

#### THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

Last week the gas coal trade was hardly so active as in the previous week. Loading turns were only about five or six working days, and notwithstanding there was a large supply of tonnage, the shipments of Durham coals from the Tyne were rather below an average. Several contracts have been made to supply gas coals to Sweden, and the Contractor has

undertaken that they shall be delivered at £7 per keel freight. The best gas collieries are fully employed. Several more cargoes of best gas coals have been shipped to America. Some have also been sent to the Mediterranean; and the moderate rate of freight which is current has induced the Irish Gas Companies to take a good deal of gas coal this season. Cargoes were shipped for Dublin, Tralee, and other parts of Ireland last week. There is not much demand for second-class gas. One of a new class of steamers built specially for the gas trade, and named the *Royston*, was launched from the shipbuilding yard of Messrs. Palmer and Co., Limited, at Jarrow-upon-Tyne, last week. She will be fitted with Price's patent self-trimming hatchways and patent windlasses. She is flat-bottomed, and her masts, funnel, davits, and boats are so constructed as to be lowered in order to allow the vessel to pass beneath the Thames bridges. She is intended to run between the Tyne and Thames, with gas coals for the London Gaslight Company, Nine Elms. She will carry 1000 tons of coal upon a draught of 12 feet 8 inches. She is built for Messrs. S. and C. Nicholls, Bishopsgate Street Within, London. Her sister ship is upon the stocks, and it is very probable that if they succeed, other vessels of a like class and build will be constructed. The Northumberland steam collieries got to work last week. The best pits have as many orders on hand as will keep them going two or three weeks. Second-class steam collieries are not so well employed, but they are not doing very far amiss. The mild weather keeps back any extra inquiry for house coal, and the trade is dull.

There has been a good demand for vessels to load out for the Mediterranean and the Black Sea, but mainly for the Italian ports of the Mediterranean. There is an abundance of tonnage, however, on offer, and rates are low. The same sort of thing operates upon the coasting trade. There is a great deal more shipping than there is demand, and London rates for steamers are only 4s. 1½d. per ton, Rochester 4s. 3d., with the Channel and French ports, in proportion. They are not likely to improve for some time, and steamers are being fixed for London for a round of voyages, extending over six months, at very little beyond the above quotation. Small sailing ships, to load coals for London, are able to procure a rate of something like 4s. 10½d. per ton.

The principal shipments of goods from the Tyne are lead and copper. Lead especially has been sent to the Continent in large quantities. Pig lead is quoted here at £20 5s. per ton; copper flat cake and ingot, £74 to £75; best selected, £76 to £77 per ton; manufactured iron, common bars, £6 5s.; merchant bars £9 per ton. The pig iron, local make, is—No. 1, 45s.; No. 3, 41s., net cash. The chemical market is extremely weak, with no alterations in prices, which are as low as ever was known in the history of the trade.

#### TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Some months ago, as it may be remembered, the Town Council of Dumfries adopted the Burghs Gas Supply (Scotland) Act, and resolved, in terms of the Act, to apply to the Dumfries Gas Company to dispose of the gas-works. The Company agreed to treat for a sale, and appointed as arbiter on their behalf Mr. S. Stewart, of the Greenock Corporation Gas-works; while the Town Council, on their part, appointed Mr. B. M. McCrae, Manager of the Dundee Corporation Gas-works; and as the umpire, those two gentlemen mutually fixed upon Mr. Alexander Smith, of the Aberdeen Gas-works. Fully a week ago the arbitration was concluded, and the result of the deliberations was an award of £21,000, in full of all claims, but exclusive of all stock, or moveable plant, and outstanding accounts, or accounts due for gas. The value of the mortgages will be deducted from the above, in terms of the Act. On the whole, the award is considered fair, the interests of both parties having been justly cared for; still, in proportion to the quantity of gas sold, it is lower than the awards given in Kilmarnock, Alloa, and some other places in Scotland where the gas supply has been transferred to the Municipal Authorities within the last few years. Prior to the passing of the Act, the Dumfries Town Council proposed to purchase the gas undertaking, and offered the sum of £18,000, but the Company would not cede their rights and property for less than £23,000. In the interim, however, the plant and other property have been materially increased. The works are to come into the possession of the town at Whitsunday.

At the last monthly meeting of the Police Commissioners of the burgh of Moffat, the propriety of adopting the Act was under consideration in a sort of way. Mr. Richardson, one of the members of the Commission, had previously given notice of motion for the formal consideration of the Act, with a view to its adoption; but at the meeting in question, with the permission of the Commissioners, he withdrew his motion, as he had found that, in all probability, there would be some difficulty in taking over the works of the Gas Company, the consent of two-thirds of the Shareholders being required before any sale could be made, while, in the event of their refusing to treat with the Commissioners, they would require to erect new works. At any future time the Commissioners could raise the question.

On Tuesday last the usual report upon the analysis of gas was submitted to the Edinburgh Town Council by Mr. J. Falconer King. It bore that on the 12th inst., when the examination was made, the gas supplied by the Edinburgh Gas Company had an illuminating power equal to 29.70 candles, while that supplied by the Leith Company stood at 28.30 candles. In reference to this matter, Mr. Somerville mentioned that the Cleaning and Lighting Committee, after considering the motion remitted to them in connection with the analysis made on the 28th of January, had resolved to recommend that no action be taken. It was found, he said, that the Leith Company suffered some injustice in consequence of having the gas for analysis taken at a greater distance from the works than was the case with the Edinburgh Company's gas. One of the members of the Council expressed himself as being astonished at the statement, and said that he had always been led to understand that gas improved in quality rather than suffered deterioration by long carriage in the mains. Of course, such a fallacy requires no contradiction. The recommendation mentioned by Mr. Somerville was adopted by acclamation.

At the last meeting of the Burntisland Town Council the acquisition of the gas-works was again under consideration. There was submitted a report upon the condition and value of the existing works, which had been furnished by a Gas Engineer (Mr. Whimster, I think, of Perth). The full value of the works was estimated at £4112, and the Council resolved to offer that sum to the Proprietors, the North British Railway Company.

A meeting of the Committee of the West of Scotland Association of Gas Managers was held in Glasgow on the 18th inst., at which nearly all the members were present. After the ordinary business of the Association was concluded, the President, Mr. M'Gilchrist, Dumbarton, in the name of the members of the Committee, presented to Mr. John Allan, Edinburgh, the official reporter to the Association, a number of valuable books, as a mark of the respect in which the Committee held Mr. Allan, and in recognition of the elaborate and accurate manner in which he had noted and reported in detail all the proceedings which had taken place at several of the half-yearly meetings recently held by the Association. The President also passed a high eulogium on Mr. Allan, not only as a reporter, but also as a thorough gentleman, and said he was sure he spoke the sentiments of all



the members of the Committee when he said that every one was thoroughly satisfied with the manner in which he had performed his duties. They all trusted that he would long be spared to enjoy a happy and prosperous life. Mr. Allan replied in suitable terms.

New gas-mains are to be provided in various streets in the city of Aberdeen, at an estimated cost of £2100. The main-pipe leading to Maggiemoss and Woodside has been found to be insufficient for the supply required in those districts, owing to the large number of new buildings which are making demands upon the Gas Commissioners, and before the next lighting season a larger pipe will be provided, at a cost of £1400. An additional main-pipe is also required for Alford Place, at a cost of about £500, and an extension of the main from Mile End, at an estimated cost of £200.

Not content with the service received from the Inverness Gas Commissioners, the Directors of the Highland Railway Company are about to start gas-works on their own account in the capital of the Highlands. The contemplated works are to include a gasholder capable of containing 15,000 cubic feet, a retort-house, with seven retorts, and chimney-stack, together with the necessary condensers, purifiers, coal-store, &c., &c. The chief purpose of these new works is the lighting of the railway station, the offices, workshops, &c.

Some difficulty seems to have arisen between the Gas Company of Musselburgh and the Mid-Lothian Coast Artillery Volunteer Brigade, on account of alleged injury to the pipes under the Company's gasholder, caused by the firing of the guns at the battery belonging to the brigade, which, it seems, has been in its present position for 15 years, without any complaint on the part of the Gas Company. Some time ago the Town Council called upon the Volunteer Artillery Brigade to remove the battery; but as that has been objected to, the Gas Company have been requested to get a report from a practical Engineer as to the alleged injury to the pipes by the vibration resulting from the firing.

The Dundee Gas Commissioners, at their last monthly meeting, had under consideration a report from Mr. McCrae, the Manager, regarding the recent case of suffocation in Foundry Lane, by which two women lost their lives. It showed that the Commissioners officials were in no way to blame for what had occurred, and suggested that a notice should be issued warning people of the danger to which they exposed themselves by not immediately attending to an escape of gas. The circumstances of this case were somewhat peculiar. The parties living in the house had not for years been using the gas, but the landlord had left within the coal bunker a pipe connected with the meter, which, from having been in a rather out-of-the-way place, had not been attended to, or probably had not been known of by the inmates. Some accident had happened by which the pipe was broken, and gas flowed into the room and proved fatal to the occupants. The matter has been remitted to Mr. Maxwell, and he proposes to circulate handbills, putting the matter in a distinct way before the public, so that there may not be such another affair.

The Police Commissioners of Kirkintilloch have instructed their Clerk to give notice to the Gas Company of that town, in terms of clause 21 of the Gas Supply Act, that they are willing to buy, or treat for the purchase of, the undertaking of the Company.

Dr. Wallace's report upon the Glasgow gas for the week ending Feb. 9 shows that in no case was the minimum illuminating power below 26'23 candles; in the western district the maximum reached to 28'84 candles, and the average over the four districts ranged from 26'63 candles to 27'90 candles. The highest maximum illuminating power found in the week ending Feb. 16 was 28'00 standard candles in the Western district; and the lowest maximum was 25'67 candles Southern district. The average ranged from 26'44 candles to 27'79 candles.

Preliminary steps have just been taken with a view to having gas introduced into Townhill, a village of 1800 inhabitants, nearly two miles from Dunfermline, and which, with the two collieries near it, is within the boundary of the burgh. It is considered probable that gas will also be introduced into Kingsseat village, which lies two miles east from Townhill, and is also situated within the burgh of Dunfermline.

It was reported to the Galashiels Town Council on the 11th inst. that the new water-pipes had been tested, and, with slight exceptions, they had proved satisfactory. With regard to the reservoirs, it was stated that on the previous Saturday morning the water had been turned in to Knowsdean, and that there were 14 feet of water in it, which had stood almost without any subsiding.

A very indignant feeling is arising in the town of Forfar, on account of what threatens to be a keen opposition which is being raised against the Water Bill. Two petitions have been lodged against it, one by the Caledonian Railway Company, and the other by no fewer than eighteen manufacturing firms in the town. The objections are chiefly raised against the rating clauses. Already an indignation meeting of the townspeople has been held on the subject, and on Wednesday week the Police Commissioners, at an adjourned meeting, considered the position in which the water question was by the lodgment of the two petitions; and it was eventually resolved, by nine votes against five, to abide by the rates proposed in the Bill.

The Arbroath Police Commissioners have agreed to allow the inhabitants to take the water supply into their houses, for culinary purposes only; the payment to be at the rate of 1s. per 1000 gallons, as gauged by meters.

Mr. Coyne, Superintendent of the Edinburgh Water-Works, reports that the quantity of water sent into the city and district during January was equal to 6231½ gallons per minute, which represents 8,973,721 gallons per day, or 31'28 gallons per head per day to the estimated population of 286,800. The supply to Edinburgh was 32 gallons per head per day to a population of 229,872; to Leith, 29 gallons per head per day to a population of 50,870; and to Portobello 27 gallons per head per day, to a population of 6058.

In his fourth quarterly report for 1877 of the Glasgow Corporation Water-Works, Mr. Gale states that last year was the wettest year since 1872, and at most of the stations it had been the wettest since the gauges were erected in 1854. The average quantity of water sent into the city and district during October, November, and December was 33,730,000 gallons per day, and the average for the whole year was the same. During the three months named, 4½ miles of pipes for extensions and improvements had been laid, and authorized at an estimated cost of £3973. As an evidence of the extent to which modern conveniences are being introduced into dwellings, the report states that during the past year 7486 water-closets and 393 urinals were put up in new houses. In 1864 an examination of the water-closets within the area of supply showed that the number was 28,054. The increase since then has been very great, and the number of these appliances must now closely approach 100,000.

It has been resolved by the Glasgow Corporation Water Commissioners to give water through the River Supply Works at the rate of £1 per 100,000 gallons, unless in those cases fixed by Schedule A of the Act, in which the charge is 5s. 6d. per 100,000 gallons.

MELTON MOWBRAY GAS COMPANY.—The half-yearly meeting was held on the 1st inst., when a dividend of 20s. per share on the original shares was declared, and 5 per cent. on the new capital.

LLYNNI VALLEY GAS COMPANY.—At the half-yearly general meeting on the 15th of February, the Directors recommended a dividend of 5 per cent. for the half year, leaving a balance of £30 12s. to be carried forward. The Directors are in communication with the Railway Company, to ascertain if they will grant permission to lay the mains through the new tunnel, so as to supply the Glyncoirwg and Cymmer districts with gas.

HOYLAK AND WEST KIRBY GAS AND WATER SUPPLY.—A company has been formed for the purpose of supplying gas and water to these rapidly-rising localities in Wirral. The capital is £25,000, in £5 shares. A central site for gas-works has been selected, and a plentiful supply of water is confidently anticipated from an elevated spot near Newton-cum-Larton, about a mile from West Kirby.

BROMSGROVE GAS COMPANY.—The report of the Directors presented to the meeting of Shareholders, on the 11th inst., stated that the works and mains were in a good condition. The accounts showed that there was an available balance of £823 7s. 9d., out of which it was proposed to pay a dividend of 9 per cent., and carry £13 7s. 9d. to the reserve-fund. A sum of £70 was awarded to the Directors for their services during the year.

PRICE OF GAS AT ORMSKIRK.—A correspondent writes:—"In a late issue, you, in a Lancashire list, erroneously quoted the price per 1000 cubic feet of the gas at Ormskirk. It ought to have been—Net price to the public lamps, 4s. 6d.; to private consumers in Ormskirk, 4s. 9d.; and in the out-townships, 5s. The net price has been reduced from the 1st of January last to 4s. 3d. to public lamps; 4s. 6d. to private consumers in Ormskirk; and 4s. 9d. in the out-townships."

LIGHTING A COLLIERY WITH GAS.—The Manners Colliery Company, Ilkeston, have applied to the Ilkeston Local Board to lay in service-pipes to supply their colliery with gas. The Company are ready to use gas not only on the surface, but in the underground workings, and the Board have agreed to lay in the gas-main half the distance required, or 150 yards, on condition that the Company lay in the other half, and use gas both underground and on the surface.

BEVERLEY GAS SUPPLY.—At the meeting of the Beverley Town Council, on the 11th inst., it was stated that the mortgage on the gas-works was between £15,000 and £16,000. By a wise mode of borrowing the two last loans, part of the principal as well as the interest had to be paid annually, so that the gas-works had to provide a sum of between £900 and £1000, which caused a serious increase in the price of gas, and was equal to 9d. per 1000 feet. During the last year, the gas, not calculating the interest on borrowed money, cost 2s. 8d. per 1000, but when interest on loans was added it raised the price to 3s. 5d.

BRIGHTON WATER SUPPLY.—At the meeting of the Board of Guardians, on Tuesday, the 29th ult., the Committee appointed to inquire into the capabilities of the Warren Farm well, at the Industrial Schools, and the cost of developing the same, presented a report. The Committee were of opinion that if an arrangement could be made by which the resources could be made available, for sale or otherwise to the inhabitants of the neighbouring parishes who are mooted the question of establishing water-works in their own locality, it would be not only advantageous to them, but would also go far to recoup the ratepayers of Brighton their original large outlay in sinking the well. One of the Engineers plans submitted calculated that, when in full working order, the well would yield 25,000 gallons of water per day of eight hours. The Board resolved that the report be printed, and brought up for consideration in a month's time.

SHREWSBURY GAS COMPANY.—An extraordinary meeting of Shareholders was held on the 7th inst., to consider an application to Parliament for raising additional capital. The Chairman (Mr. A. G. Brookes), who presided, said the capital of the Company was £46,000, and the gas made annually amounted to 76 million cubic feet, and was continually increasing. The Company had bought some land, and required additional capital to build retort-houses, &c., necessary for their increasing business. They wished also to extend the radius, from three to six miles from Shrewsbury, over which they were at present empowered to supply gas, and they also desired to convert their A, B, and C shares into 7½ per cent. stock. Directly the Act passed, £5000 worth of shares would be put in the market, and it was proposed to put them up by auction or by tender, and they expected they would realize £7500, or 60 per cent. premium, by that means. A motion approving of the Bill was unanimously adopted.

THE ELECTRIC LIGHT.—The new magneto-electric light was inspected on the evening of the 18th inst. by the Lord Lieutenant, who honoured Messrs. Edmundson and Co.'s factory, Stafford Works, with a visit. Mr. J. R. Wigham, one of the members of the firm, attended on his Grace, and explained the principle of the machine by which the light is produced, and also the clockwork mechanism of the lamp by which it is made steady and continuous. An experiment was shown in which the light was burned under water, and the means of applying this magnificent light for light-house and other illumination were also explained to his Grace. The Irish fog siren, gas fog gun, and Daboll fog trumpet, which were in process of manufacture on the premises, were also shown to his Grace, who expressed great gratification with what he had seen. The new horizontal silent gas-engine was also examined by his Grace with much interest. His Grace was accompanied by General the Right Hon. Sir John Michel, G.C.B., and attended by Captain Beresford, A.D.C.—*Freeman's Journal*.

GRANTHAM GAS COMPANY.—The half-yearly meeting was held on the 4th inst.—Mr. J. F. Burbidge in the chair. The Directors reported that they had little to bring under the notice of the Shareholders, but had pleasure in announcing the continued prosperity of the undertaking. The revenue account showed a balance of profit of £2791 3s. 10d. The report was adopted. The dividends in this Company are only declared annually at the meeting in August. The remuneration of the Directors was increased from £100 to £200. In acknowledging a vote of thanks, the Chairman said the Directors had come to the conclusion that it would be wise to increase the capital of the Company, and they had given notice of a special meeting for the 4th of March, when the subject would be taken into consideration. They founded their opinion on the supposed requirements of the Company. There was a considerable amount of work to do, which would take a good deal of money; the Directors also proposed to pay off the debentures. The amount to be raised had not yet been finally decided, but it would probably be £5000. There was another thing he might mention, which would no doubt be pleasing to the people of Grantham. They intended, if all went on well, to reduce the price of gas at the next half-yearly meeting.

THE WATER SUPPLY OF SOUTH COAST WATERING-PLACES.—Mr. Wigner gives as the results of his investigations on the water of supply seaside watering-places, that the best waters tested are those of Exmouth, Kingswear, Ryde, Paignton, Weymouth, Plymouth, Portsmouth, and Ventnor, and these are followed very closely by Teignmouth, Lynton, St. Ives, Dartmouth, Penzance, Gosport, West Cowes, Devonport, East Cowes, and Ilfracombe. They may all be ranked as first-class waters, and it is satisfactory to know that about 800,000 residents, and probably 500,000 visitors, or about 800,000 persons in all, are supplied with water of excellent quality. Eleven other places—namely, Seaton, Sidmouth, Shanklin, Brixham, Clifton, Portis-



head, Westward Ho, Falmouth, Sandown, Torquay, and Weston-super-Mare—are supplied with water which must be considered as second-class. The defects in these waters, however, are not very serious, and in almost every case are due either to imperfect storage or imperfect filtration. The only places where the water supply may be characterized as third-class are where there is no public supply, but the water is derived from pumps and wells, or direct from the river. Amongst these he feels it a duty to mention Dawlish, Freshwater, Yarmouth (Isle of Wight), Kingskerswell, Seaton, and Paynton.—*Sanitary Record*.

**WIDNES GAS AND WATER SUPPLY.**—The Gas and Water Committee of the Local Board have reported that the water pumped during the year 1877 was 421,020,150 gallons, as compared with 364,690,994 for 1876, being an increase for 1877 over 1876 of 15·4 per cent. The gas made during the year was 66,264,000 cubic feet, as compared with 62,622,000 cubic feet for the year 1876, being an increase of 7·41 per cent. for 1877 over 1876. The rainfall for last month was 3·52 inches, and for last year 50·36 inches. The Accountant's report as to the working of the gas department for the year ending Dec. 31, 1877, shows:—Gross receipts from gas-rentals and products, £14,145 16s. 8d.; sundry receipts from fittings, &c., £329 11s. 6d.—total, £14,375 8s. 2d. Cost of manufacture, including all expenses, £10,408 7s. 10d.—gross profit, £3967 0s. 4d. Depreciation, £500; bank interest and commission, £356 17s. 6d.; interest on loans, £2168 19s. 5d.; sinking-fund, £929 2s. 8d.—£3954 19s. 7d.; net profit, £12 10s. 9d. The Accountant points out that the recent reduction in the price of gas has caused a decrease in the receipts during the past six months of £750, and that the £500 deduction from profits for depreciation is a new item. The Engineer's estimate, prepared at the request of the Finance Committee, of the probable requirements on capital account of the Gas and Water Committee, is £40,000 for gas-works purposes, and £50,000 for water-works purposes.

**REDUCTIONS IN THE PRICE OF GAS.**—At the meeting of the Beverley Corporation, on the 11th inst., the Gas Committee reported that, having fully considered the subject of a reduction in the price of gas, they were prepared to recommend that it be reduced 5d. per 1000 feet from the 1st of January last—i.e., to 3s. 9d., but that no higher rate of discount than 5 per cent. be allowed—to consumers of more than 100,000 feet and less than 200,000 feet, 2½ per cent.; 200,000 feet and upwards, 5 per cent. At the meeting of the Liverpool Gas Company, on the 19th inst., it was reported by the Directors that the price of gas had been reduced 3d. per 1000 from the beginning of the year, making the present price 3s. 6d. The Directors of the Abersychan Gas Company have informed the Local Board of the district that from the 31st of March next the Board would supply gas at the rate of 3s. 9d. per 1000 cubic feet, instead of 4s., as hitherto, being a reduction of 3d. per 1000 cubic feet. The Directors of the Hartlepool Gas and Water Works Company have sent the following letter to the West Hartlepool Improvement Commissioners:—

*Hartlepool Gas and Water Works Company, West Hartlepool,  
Feb. 15, 1878.*

W. W. Brunton, Esq., Clerk to the West Hartlepool Improvement Commissioners.  
Dear Sir,—I beg to inform you that my Directors have determined to reduce the price of gas in West Hartlepool (except in cases of special contract) to 3s. 4d. per 1000 cubic feet after the expiration of the current quarter, subject to discounts per scale on the other side, if paid punctually within one month after the expiration of each quarter. The public lamps will be supplied at the lowest rate—viz., 3s. 4d. per 1000 feet, less 10 per cent., equal to 3s. net.

Yours truly,

THOMAS TREWHITT, Secretary.

*Scale of Discounts.*—Under 50,000 feet per quarter, 2½ per cent.; 50,000 and under 100,000 per quarter, 5 per cent.; 100,000 and under 200,000 per quarter, 7½ per cent.; 200,000 and upwards per quarter, 10½ per cent. No discount will be allowed on fractional parts of 1000 cubic feet.

At the Oswaldtwistle Local Board meeting, on the 11th inst., it was resolved that, after the 1st of April next, the price of gas be reduced 4d. per 1000 feet—namely, to 4s. 2d. to consumers under 250,000 feet in the half year, and to 3s. 11d. to consumers of quantities above 250,000 feet in six months; and that a discount of 5 per cent. be allowed as at present; but such discount shall be allowed only on every complete 5s. of the charge of gas. At Southtown, near Yarmouth, the Company have decided to reduce the price of gas from 5s. 5d. to 5s. 3d.; the change to take effect after the 31st proximo. The South Shields Company have announced a reduction of 3d., making the price, with the discount to ordinary consumers, 3s. 1d. per 1000. At Colchester the Directors of the Gas Company have determined upon a reduction of 3d. The Abersychan Gas Company's charges from March 31st next will be reduced from 4s. 7d. to 4s. 2d. per 1000 cubic feet to private consumers, and from 4s. to 3s. 9d. per 1000 cubic feet to the Local Board. The Blaenavon Gas and Water Company have also announced a reduction to their gas consumers, from 5s. to 4s. 9d. per 1000 cubic feet. The price of gas at Ipswich was reduced at the commencement of the year from 3s. 9d. to 3s. 6d. At Eastbourne the Directors propose to reduce the price in October next from 5s. to 4s. 7d.

**LOCAL GOVERNMENT INQUIRY AT LEAK.**—On the 15th inst., Mr. Harrison, C.E., held an inquiry at Leak on the application of the Improvement Commissioners to vary a Provisional Order to increase their borrowing powers, and to borrow a sum of about £17,000 for various works and improvements. The first item asked to be borrowed was £1625 for the laying down of gas-mains in new streets. The next was £4000 for a new tank and gas-holder. This it was proved was absolutely necessary, as the Commissioners had not sufficient storage room for a day's make of gas. Hence, it frequently happened that gas had to be blown off, at a great loss. The Clerk (Mr. Henshaw) stated that, with respect to the gas account, the total amount borrowed by the Board on this account was £9300. He produced a statement of receipts from the gas-works, which showed a large increase. Since the passing of the Act, £9512 had been expended in extensions, and £1220 for maintenance of works. Sixteen million cubic feet of gas were made during the last six months. The payments on the gas-works account in 1858 were £1388; in 1868, £1959; in 1870, £2380; and in 1876, £4115; the total expenditure during the whole period being £50,589. The net profit was over £27,000. When the question of rates came before the Inspector, he asked why the profit of the gas-works had been employed to keep down the rates, instead of keeping it to its own account. Mr. Allen, who appeared for the Commissioners, said they had tried to keep down the rates, so as to give the ratepayers no cause for grumbling. Mr. W. Challinor said he thought that the ratepayers had pretty well borne their burden during the last 10 or 14 years. Many valuable properties had been bought, and not only had the interest been paid, but contributions also had been made to the sinking-fund. Mr. Harrison said that if the General Purposes Committee had borne their own burden there would have been accumulated sufficient profits on the gas-works to make the extensions. Further discussion took place as to the appropriation of the gas profits. The Inspector expressed his opinion that nothing should be appropriated to the general purposes rates until the extensions of the year had been paid for. Mr. Ward said that if no profits were to be appropriated towards the reduction of the rates, the debt on the works would soon be paid off. Mr. Allen said that they had not got the money to build the gasholder. They must have the holder soon, because they would be in darkness next winter if they did not. They had been in darkness one night this last winter. The Inspector said there seemed to be no doubt that the gas-

holder was wanted. The question was whether they could wait two or three years while the money was got. Mr. Shaw thought it would be hardly fair to the ratepayers to levy a very large rate for the next two or three years for the purpose. Mr. Ward said the question was a very serious one, affecting the whole kingdom. Mr. Lyon, Gas Engineer, Manchester, said he had examined the gas-works at Leak, and found the existing works insufficient for the present. The present storage was 160,000 cubic feet, and the largest consumption was 117,000. It was very inconvenient and costly to make gas without sufficient storage room, and he was sure that a new gasholder was necessary. The cost of a new gasholder and tank to hold 300,000 feet would be about £4000. This would probably be sufficient for eight or ten years to come. Mr. Frost, the Town Surveyor, said he had prepared an estimate of the cost of the gas-main extension. The cost would be about £1625. The other works contemplated were then inquired into.

## Register of New Patents.

3692.—GODFREY, S., and HOWSON, R., Middlesbrough, "*Improvements applicable to gas furnaces, and in the utilization of gas furnaces.*" Provisional protection only obtained. Dated Sept. 21, 1876.

This invention has reference to letters patent (No. 4414) granted to the same inventors on the 20th of December, 1875, and the present invention consists in using a steam jet for producing the requisite pressure, so as to dispense with the gasholder. The jet is of the ordinary well-known construction; but its position must be such that the ejected steam, mixed with air, must pass through the incandescent fuel with which the retort or gas generator is supplied. By this arrangement the steam becomes decomposed into its constituent elements, and a pressure is set up in the retort or generator, which propels the gas, and causes it to issue at the burner with the requisite degree of force.

3745.—COLLET, H., and DENANS, J. B., Paris, "*Improvements in apparatus for distributing, purifying, and regulating the flow of liquids.*" Patent dated Sept. 25, 1876.

This invention relates to an improved mode of constructing high-pressure cocks or valves, and consists in the employment of india-rubber valves or obturators not liable to deterioration or decay, and so constituting at the same time a closing valve or stopper, and a gland or stuffing-box. The invention is applicable to apparatus of every description for supplying and distributing water. By the use of these two obturators united—that is to say, rigidly connected or forming one—the deterioration of the glands and of the closing valve and all liability to leakage are obviated.

3756.—WIRTH, F., Frankfort-on-the-Maine, "*An improved method of treating spent materials from the gas-works by recovery of sulphur.*" Patent dated Sept. 26, 1876.

The spent compounds of iron which have been used in the purification of illuminating gas contain often 40 per cent. and more of precipitated sulphur. This sulphur has heretofore been employed for the manufacture of sulphuric acid, by burning the same directly to sulphurous acid, or the same has been extracted from this spent oxide by means of carbon bisulphide or by other solvents, and by distilling off the latter and recovering the sulphur itself.

The method of recovering the sulphur according to the present invention consists in heating this spent oxide in retorts of iron or clay (for instance, retorts which are used in the manufacture of illuminating gas) or in suitably constructed ovens of brickwork. At the same time, when the sulphur begins to distil, superheated steam is introduced. Without employing superheated steam, the vapours of the sulphur evaporate slowly, whilst by employing superheated steam the distillation of the sulphur is quick, and the sulphur evaporates very easily. Whilst in closed steam-boilers the steam pressure is augmented in the same proportions as the temperature is raised, superheated steam can be furnished, of any desired temperature, without any tension or pressure. By superheated steam the temperature is quite independent of its tension. If common steam is let through iron pipes, heated to red heat, the steam leaves the pipes having just the same temperature as the red hot iron. Such superheated steam is invisible, and is exactly like a gas. In a current of such superheated steam, wood and paper become brown, and sealing wax and even lead and tin are melted.

The improved method of treating the spent oxide of iron by recovery of sulphur, and by recovery of Prussian blue, or prussiate of potash, is as follows:—The humid material is ground in a mill to form a fine mass. This mass is then lixiviated by means of water. If the mass contains ammonia in a free state, the lye can be neutralized by an acid. By this lixiviation the soluble ammonia salts are obtained, which are by evaporation crystallized, or employed in the usual manner by any suitable copper salt for the precipitation of sulpho-cyanide of copper, or distilled with lime to obtain volatile ammonia. Water is again poured on the lixiviated mass, and simultaneously caustic soda, or carbonate of soda, or lime, is added to the mass. Already, by the cold digestion with such alkalies, the insoluble prussiates are converted into soluble prussiates. The clear liquid is drawn off, and treated with an acid until the same is neutralized, or gives a weak acid reaction. The weak acidified liquid is soon clouded by precipitated prussiates and sulphur. This dirty green precipitate might afterwards injure the beautiful clear colour of the Prussian blue, and is, therefore, carefully removed. The clear solution, which, if necessary, is filtered, is then acidified, and treated by a solution of perchloride of iron, or by a small surplus of any other soluble salt of oxide of iron, such as sesquichloride of iron. Prussian blue is thus obtained, which, in consequence of its purity, has a dark blue colour, and when dried shows a copper lustre on its fractures. This product is employed as Prussian blue itself, or is converted into prussiate of potash.

For the manufacture of prussiate of potash, the spent oxide has hitherto been treated directly by caustic potash or by carbonate of potash, and the lye has been evaporated; or the lime containing spent oxide has been treated with carbonate of potash, and after filtering off the carbonate of lime the lye has been evaporated. In both cases great masses of diluted lye have to be treated, and there is danger of producing a decomposition of the prussiate of potash. These lyes also always contain sulphocyanide of potash, which is to be found again as a contamination in the prussiate of potash. Consequently it is preferred to precipitate the acidified solution by sesquichloride of iron, to wash out the Prussian blue, and to obtain, by this washed Prussian blue, the yellow prussiate of potash, by any known manner.

The spent oxide of iron, lixiviated in this manner, contains a great quantity of sulphur in a free state. The mass is dried, and then, as above described, distilled for recovering the sulphur. During this distillation superheated steam is led over the heated mass, by which means the sulphur to be recovered is distilled off in a very short time.

This process distinguishes itself from those heretofore used, as the inventor does not employ any solvent for the sulphur, but distills it off the sulphur together with steam. In the same manner the sulphur is recovered from the gas lime, if lime is used in the place of iron for desul-



phurating the illuminating gas; and in the like manner this method can be employed for the recovery of sulphur from any other masses or ores containing sulphur.

The lixiviated and desulphurated mass is heated whilst air is admitted, and the product is a beautiful brown colouring mass, *caput mortuum*, which can be employed as a paint.

If the sulphur only is to be recovered from the spent oxide, and if the recovery of the cyanides is dispensed with, it is advisable to do away with the crushing or pulverizing of the spent oxide in a mill. The desulphurated masses can be used anew for the purification of the illuminating gas.

3763.—BLUNDELL, G. T., BLUNDELL, J. W., Limchouse, and HOLMES, F., Victoria Park, "Improvements in pumps." Patent dated Sept. 27, 1876. This invention consists in employing three or more pistons working in one pump-barrel, which pistons are so worked or operated as to alternately approach and recede from each other by means of two cranks working two cross-heads or connecting-rods, which are attached to the pistons. The valves are so arranged that the water can gain access to the spaces between the pistons by channels outside the pump-barrel. The pump-head may be fixed, or may be so arranged as to form or act as a delivery-valve, or in some cases dispensed with entirely.

The delivery from the second piston may, in some cases, be so arranged as to discharge through the top piston by means of a trunk piston-rod closed with a valve.

The invention also applies to bilge or other pumps having one piston and double action, the pump-head or cover being so arranged as to act as a delivery-valve for the up-stroke, and the delivery water for the down stroke will be discharged through a hollow piston-rod or trunk surmounted with a valve.

The invention may also be applied to pumps having two pistons with a quadruple action. In this case fixed covers may be employed, and four valves in two chambers are required, instead of eight valves in four chambers, as is usual in other pumps hitherto employed for similar purposes, or the covers may be loose, when they will act as delivery-valves.

3792.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in apparatus for obtaining motive power, which apparatus is also applicable to the condensation and rarefaction of gases and vapours." Patent dated Sept. 29, 1876.

This invention relates to apparatus for converting heat into motive power, and consists of a mechanical arrangement in which the motive power force may be generated in the two following modes, namely:—1. Partly

by the alternate generation and condensation of steam, and partly by the alternate rarefaction and condensation of air or of other gases at any density, such rarefaction and condensation being due to variations of temperature in the air or other gases. 2. By the alternate rarefaction and condensation of air, or of other gases, at any density, without steam, such rarefaction and condensation of the air, or of other gases, being due to variations of temperature in the air or other gases. The apparatus can also be used for the compression and rarefaction of gases and vapours, the compression and rarefaction of the gases and vapours being effected by alternate rarefactions and condensations of portions of the gases and vapours themselves, through the agency of changes of temperature.

The mechanical apparatus for carrying the above into effect consists principally of a cylindrical vessel, provided with a displacer (formed somewhat similarly to a piston) working freely in it. When this displacer is moved to that end of the vessel in which the water is injected, the gaseous contents are shifted to the hot end, and thus they pass over the regenerator surfaces. When the displacer is moved to the hot end of the vessel, the gaseous contents are shifted to the cold end of the vessel, passing back again over the regenerator surfaces. Connected with this vessel is another smaller cylinder, fitted with a piston and rod, to which is attached a connecting-rod transmitting motion to a crank-shaft.

#### APPLICATIONS FOR LETTERS PATENT.

511.—BAGGELEY, H., Kensington, "Improvements in the treatment of sewage and in the manufacture of manure therefrom, also in the apparatus or means to be employed therein, partly applicable to the treatment of noxious vapours from chemical and other works." Feb. 7, 1878.

522.—YOUNG, W., Clippens, N.B., "Improvements in the manufacture or treatment of illuminating gas, and in the apparatus employed therefor, the said apparatus being also applicable for the treatment of gases other than illuminating gases." Feb. 8, 1878.

534.—CLARKE, J. F., Moorgate Street, London, "An improvement in apparatus for distributing water in public thoroughfares." Feb. 8, 1878.

542.—JOSLIN, G., Colchester, Essex, "Improvements in gas-meter indices, and in apparatus for testing the agreement of the measuring chambers of gas-meters with the standard gasholder, and the accuracy of the indices." Feb. 9, 1878.

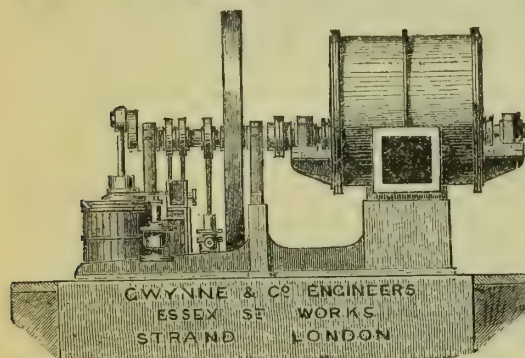
555.—BROWN, J., Old Kent Road, London, "Improvements in cocks or valves." Feb. 9, 1878.

562.—JEFFERIES, J. H., Wolverhampton, Stafford, "Improvements in ball and bib taps." Feb. 11, 1878.

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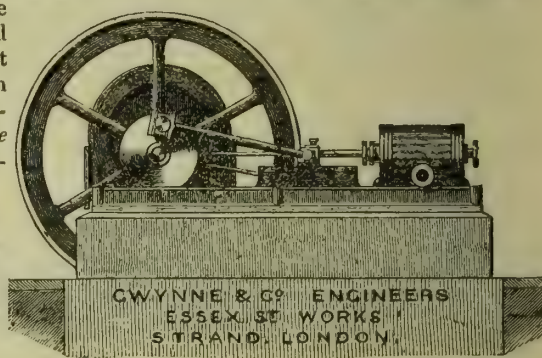
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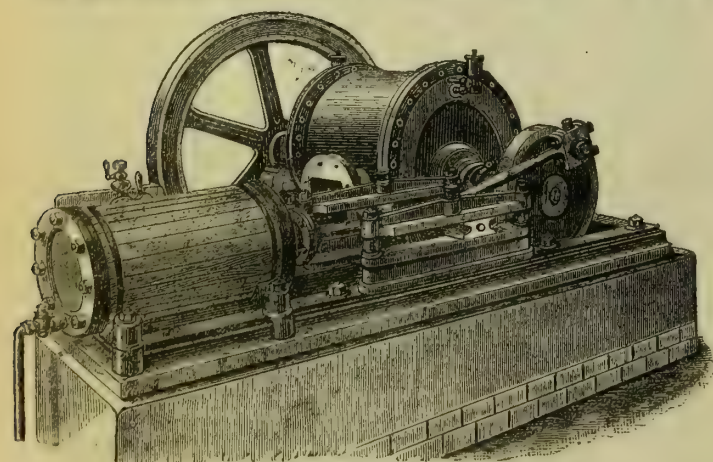
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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 5, 1878.

Circular to Gas Companies.

THE "Gas-Works Clauses Bill," introduced to the House of Lords by the Lord Chancellor, has been printed and issued. It is intended, as we mentioned last week, to consolidate, with amendments, the two General Acts of 1847 and 1871, and with these is included some of the provisions of the Model Bill drawn by Lord Redesdale. The amendments, as they are called, are so few in number, and, for the most part, of so simple a character, that we rather wonder at its being thought necessary to promote this measure, which we think, instead of simplifying matters, may prove a source of perplexity. The Act is to come into force on the 1st of September next, and from and after that date the Acts of 1847 and 1871 are repealed; it being, of course, provided that this repeal shall not affect any Act of Parliament or Provisional Order granted before the date of this Act. Among the amendments is a clause taken from Lord Redesdale's Model Bill, which enacts that when no pressure is prescribed in a Special Act or Provisional Order, it shall be understood that the pressure is to be six-tenths and eight-tenths within the usual hours. The section which prescribes the mode of testing for pressure is taken from the Model Bill, and it enacts that a

Gas Examiner may, after giving two hours notice to the Company, break up any street or road for the purpose of making the experiment. If such tests be frequently made, they may become a source of more annoyance than protection to the public. Another clause, taken from the Model Bill, is that which requires undertakers to pay interest on money taken as security, at the rate of five per cent. per annum for every ten shillings kept for longer than six months. Some verbal alterations have been made in section 30 of the Act of 1871, but section 35 of the Consolidation Bill is substantially the same. Where no Gas Examiner is appointed by the Local Authority, five consumers may apply to a Justice, who shall have power to appoint one for any period he may think fit; the forfeitures are to be appropriated as provided in the Act of 1871. One of the most important alterations—we cannot call it an amendment—is that made by the insertion of a few additional words in clause 41 in the Act of 1871. The corresponding clause in the Consolidation Bill runs thus:—"If any person neglects to pay any gas-rate due from him to the undertakers, or any expenses lawfully incurred by the undertakers in cutting off the gas from the premises of such person, the undertakers may recover the same, with full costs of suit, as a simple contract debt." After this, as may be supposed, there is no clause in this Bill like the 31st section of the Act of 1871, which gives jurisdiction in such cases to magistrates, who have power to issue a warrant of distress if the debt be not paid, or the debtor do not appear. A contract debt is recoverable in the County Courts. This, we believe, is the most important alteration in the general law made by this Bill. Contrary to our expectation, no limits are placed on the payment of back dividends, nor has any attempt been made to settle a principle upon which undertakings shall be transferred. The Bill is, in fact, what it is called, a Consolidation Bill, the only novelties being provisions taken from Lord Redesdale's Model Bill, and the other provision which makes gas-rates recoverable as a simple contract debt. Gas Companies will hardly care to go to the County Court in which, if they sue a man for £2, he may get an order to pay it at the rate of two shillings a month. All Companies who are brought under this statute must rigorously exact security, notwithstanding the fact that they will have to pay interest on the money deposited. There is nothing in the Bill about sliding scale or auction clauses, which seem to be regarded as matters to be left to the option of the Legislature, and to be applied only under special circumstances.

The Chelsea Vestry are still dissatisfied with the London Company's gas, the illuminating power of which is on the average almost equal to that of the Companies under recent legislation. We rather think the Gas Examiner for the Vestry continues to test the gas with the old Sugg-Letheby burner, which is absurd, because whenever the Company go to Parliament, and are placed under similar legislation to that of 1868-9, Sugg's New "London" Argand, No. 1, is sure to be prescribed as the test-burner, and Dr. Barclay may as well begin to use it at once, and cease his futile agitation. The Vestry have applied to the Metropolitan Board of Works to take action in Parliament to compel the Company to raise their standard. But no help can come from that quarter. They now propose to go to the Board of Trade, who can do nothing for them. They must "possess their souls in patience" until the London Company make application to Parliament for further powers and additional capital, after which they will have the satisfaction of burning, under another name, gas of pretty much the same quality as they are burning now.

There seems to be some doubt as to the legality of the proceedings of the York Town Council, as reported in our last, and a protest has been lodged with the Town Clerk. The town's meeting, we believe, has not yet been called, and probably another meeting of the Town Council will be held, to ascertain whether or not an absolute majority of the Council can be obtained, which alone gives the power to call a meeting. In the meantime, we think we see a growing feeling in the town in favour of the Company. It seems to be recognized that nothing is asked for in the Company's Bill but what is reasonable, and is likely to prove beneficial to the interests of the community. For the effective supply of the city, it is absolutely necessary that the Company should have further manufacturing works; and in order, if possible, to make additional profits which will enable them the sooner to reduce the price of gas, they should have power to work up residuals on the new site. It is advisable, too, that, for the comfort and safety of some rural districts, the Company should have extended limits. For all this, it is necessary that they should have power to raise additional capital. Some people seem frightened at the sum asked for—£100,000. They forget that all this capital is not to be raised at once; it will be issued slowly, as it may be required for productive works; and as the shares are to be sold by auction, the Company will have no



interest in raising more money than will be absolutely necessary. A hundred thousand pounds of capital has lasted the Company from 1844 to this time; and as the £100,000 they are now about to raise, sold by auction, will produce £130,000, it will, with even the vastly-extended business of the Company, save the necessity of applying to Parliament again for very many years. The auction clauses are a bitter mockery. The Acts say that the dividend to be allowed on additional capital shall be seven per cent., and if the new shares were allotted to existing Shareholders, the seven per cent. would be obtained. But any investor who goes to an auction will find that he has to pay from £13 to £15 for every £10 share, and thus the actual profit which he realizes on his investment is only four and a half to five per cent. The Gas Company have made several concessions to their opponents in the Town Council; but they are asked to make one which it is impossible to yield. They are asked to state on what terms they will sell their undertaking to the Corporation now, or at any future time. Such a request is perfectly absurd, and could only have been preferred by men totally ignorant of business. The value of the York Company's undertaking increases day by day, and will continue to do so in the absence of any revolution in the art of illumination. To fix a value, then, good for all time, is an absurd proposal, which could only have been dictated by Malice, who thought he had the Company in his power, or by Ignorance, who believed other people to be as simple as himself. We have a confident expectation that the opposition will completely collapse; and we have strong doubts whether a poll of the Ratepayers at York will sanction the payment of money for any such opposition.

The Leicester Gas Company held, what we suppose will have been, their final half-yearly meeting last week, when the fact was announced, which will be highly gratifying to the Town Council who are about to take over the works, that, notwithstanding the reduction of the price of gas from 3s. to 2s. 10d. per thousand cubic feet, the gas and meter rental showed an increase over that of the corresponding half year of £831 8s. 6d. The balance on revenue account was £12,140.

The West Ham Company held their half-yearly meeting on the 22nd ult., when the usual maximum dividend was declared. It may be remembered that the Company reduced the price of gas, in the corresponding half year, threepence per thousand cubic feet. This, it was calculated, would reduce the rental £1073. Notwithstanding the reduction, however, there has been a positive increase in the rental during the past half year, which illustrates the increasing business of the undertaking. The Company have a rapidly-growing district, and to meet the wants of this district they are about to raise further capital, to the amount of £30,000. We hope the money will be raised by the issue of new shares.

The hobbledehoys of Hastings have found a new amusement. They, last week, got up a torchlight procession, and paraded the town with a band of music, with a view to compel the Gas Company to reduce the price of gas. A meeting was afterwards held at the Skating Rink, when the Company were denounced in no measured terms for their alleged extortion. It may be that the reporters have not done these gentlemen justice, for the abstracts of their speeches which we have before us read like utter nonsense. The great argument for reduction appeared to be that, as last season was a very bad one in Hastings, it was the duty of the Gas Company to reduce the price of gas in order to assist struggling lodging-house keepers to pay their other rates. One speaker made a sensible remark, and that was a suggestion that a reduced price would promote increased consumption. Back dividends seem to be a grievance at Hastings. People think that if these were not paid they might have cheaper gas, and, up to a certain point, they are right; but back dividends absorb much less money than people commonly suppose. We regard the dissatisfaction at Hastings as quite unreasonable. The character of the Manager and the Directors of the undertaking is a sufficient guarantee that as soon as possible a reduction in price will be made, but it will not be hastened by noisy and senseless demonstrations such as were indulged in last week.

The Stratford-on-Avon Gas Company, as our readers have been informed, were promoting a Provisional Order, which, amongst other things, was to enable them to raise additional capital to the amount of £17,000. They were opposed by the Corporation, who thought the Order would not be conducive to the interests of the town. Accordingly, a Board of Trade Inspector was sent down to make an inquiry on the spot. As soon as the proceedings were opened the Counsel for the Company asked for a short adjournment. It was presently announced that an agreement had been come to, in virtue of which the undertaking would pass into the hands of the Corporation. And so disappears another

Gas Company. The consideration is only very vaguely stated in the report before us, but we may take it that the Company have accepted twenty-five years purchase of maximum dividends. The transfer is to date from the 1st of January last, but the Company are to carry on the undertaking until the Corporation can obtain an Act to sanction the purchase, which cannot be passed till the next session of Parliament.

The undertaking of the Salford Corporation is rapidly regaining a state of prosperity. From the report of the Borough Treasurer, just issued, it appears that the gross profit for the last financial year amounted to £52,755, against £22,208 in the previous year. The net profit amounted to £9599, which, as we said before, has been divided amongst the different townships in proportion to their consumption.

A wonderful discovery is reported to have been made by an inhabitant of Worcester. A Mr. Stephan has discovered a means of converting steam into gas without "coal, coke, wood, oil, or" any other such combustible substance or liquid, and at such a cheap rate that the gas can be given away for nothing. A little further on we read that the most valuable results of the manufacture are certain residual products, such as tar, ammoniacal liquor, and lime, which seems to indicate that another dreamer is mixing petroleum vapour with steam, and passing them together through a red-hot furnace. The residual products alone are said to yield a profit of one hundred and fifty per cent. upon the manufacture. A little tar we can understand, but we do not see the source of the ammoniacal liquor. An exhibition of the process has been made, and it was voted very successful. Certain occult parts of the process are not yet revealed, because the discoverer's patent is not yet fully completed. Commenting upon this process, and the exhibition, a writer in the *Worcestershire Chronicle* delivers himself as follows:—"Apart from the lighting question, what a wide field is opened by this discovery of a means of producing steam without coal! The coal trade must of necessity be seriously interfered with. Users of steam and gas can make both the one from the other! A steamship, instead of carrying hundreds of tons of coal each trip will not require to do anything of the kind. Keep your gas-jets constantly burning under your boilers, and you may make not only steam for driving the machinery, but gas for lighting purposes, and for supplying the said jets. And then you have the residuary products for your trouble." In face of such a discovery as this, we certainly could not advise the Corporation of Worcester to purchase the undertaking of the Gas Company. They certainly could not compete with an invention which makes gas of forty-candle power a waste product which may be given away for nothing.

In our issue for Feb. 19, a paper and a discussion on Hislop's lime-regenerating process were reported, and they go to show that the regeneration is easily and cheaply effected, and that it offers a ready means of avoiding nuisance, and, at the same time, promoting economy. Mr. Hislop's method of desulphuretted foul lime, though not original, is noteworthy, because it obviates the necessity of removing foul lime, having an offensive odour, from the purifier, and leaves an inodorous residue to be recalcined and made ready for use. It will be remarked that, in the process, all the sulphur is saved. Having taken a great deal of interest in this question of lime regeneration, we hope to see the process tried in some of the Metropolitan works, where there are no means of profitably disposing of the spent material. We are by no means certain that Mr. Hislop's is the best means that can be adopted, but it is certainly the cheapest.

We published last week a letter from Mr. G. Anderson, on the affairs of the British Association of Gas Managers, and in our present number will be found communications from the President and Ex-President of the Association, in reference thereto. We may, perhaps, admit, with Mr. Woodall, that any differences of opinion upon administrative points can be much better discussed in meetings of the Members than in the public press. To the former tribunal we gladly relegate the question. Nevertheless, as journalists, we are bound to say that on one point we are entirely at variance with our esteemed Correspondents to-day. We believe that we had no alternative than to publish Mr. Anderson's letter, and that had we, in the exercise of our undoubted right, refused to do it, our motives would have been misconstrued, and our abstention would have been mischievous to the interests of the Association, which we desire to serve as earnestly and as disinterestedly as do our Correspondents who differ with us in this matter.

The Eighth Annual, and Thirty-third Quarterly Meeting of the Manchester District Institution of Gas Engineers was held on Saturday, the 23rd of February, when Mr. Clarke, of Ashton-under-Lyne, the newly-elected President, delivered his Inaugural Address, which will be found in another column. As in Asso-



ciations of a similar kind, the President had to deplore the absence of papers and communications, which he ascribed to the modesty of the members. We believe, after all, that the plan of the Southern Association is the best that could be adopted by the Provincial Associations. Announce a subject, and let the discussion be opened by some member who feels himself strong on the matter, and then a general conversation is pretty certain to follow, in which the views of many, if not all, the members may be brought out. This is certainly better than the formal reading of a paper, which invites discussion and also criticism, the latter sometimes becoming acrimonious, to the utter discomfiture of a modest member.

The Vestry of St. George's, Hanover Square, seem, so far, very well satisfied with the average meter system. They claim to have saved £298 last year, as compared with the cost for the corresponding period of the previous year under the contract system.

The results of a recent sale by auction of shares in the Harrogate Gas Company go to show that the confidence of the public in the safety of gas undertakings rather increases than diminishes. For the past ten years the Harrogate Company have paid maximum dividends. The shares offered were of the nominal value of £10 each, and are entitled to a dividend of seven and a half per cent. Such shares, sold in 1869, realized a premium of 47s.; at another sale, in 1871, a premium of 61s. 6d. was given. In 1876 the premiums rose to 101s. 6d., and at the sale last week they reached what we are disposed to call the extravagant sum of 115s. If investors choose to give these high premiums, we do not object; but we may candidly state our opinion that the shares were barely worth the money.

The meetings of Provincial Gas Companies continue, as we have said, to reveal a general state of prosperity. The Peterborough Company pay maximum dividends, and make up some arrears. The Red Hill Gas Company also pay full dividends. Their business seems rapidly developing, and the Directors are issuing new capital. The Barnsley Gas Company pay full dividends, and wisely carry over a large balance to the reserve-fund. As this fund has now reached a considerable amount, the Directors have resolved on reducing the price of gas threepence per thousand as from the 1st of January last. The Eastbourne Gas Company also pay full dividends on their two classes of shares, and also a bonus of six per cent. to holders of original shares, which clears off all arrears of dividends. A reduction of threepence per thousand is promised from and after the 1st of October next—that is, if the calculations of the Directors are not disturbed by unforeseen events. The Local Board of Eastbourne, we are told, are about to adopt the average meter system, and take the lighting, cleaning, &c., into their own hands. The Brighton Company, of course, pay full dividends. The plant of the Company seems to have suffered a little from the wind and the waves; but, on the whole, the condition of the works appears highly satisfactory. The Wolverhampton Gas Company pay maximum dividends, and the Directors announce a reduction of twopence per thousand on the 1st of April next, which will make the price at Wolverhampton 2s. 7d. per thousand feet. The depressed state of trade is, of course, against the progress of the Company, but small consumers continue to increase in number.

**OBITUARY.**—We are informed that Mr. Thomas Sykes, who had for a long time been Secretary of the Slaithwaite Gas Company, died rather suddenly on the 25th ult.—We have also to record the death, on the 28th ult., of Mr. William Browning, for nearly 56 years a faithful and valued servant of The Gaslight and Coke Company, at their Goswell Street station. He was 84 years of age, and was respected by all who knew him.

**LOCAL GAS SUPPLY.**—Mr. James Baynes reports that the gas sent into the district of Sculcoates and Myton by the British Gas Company, during January, gave the following results; free ammonia and sulphuretted hydrogen being at no time present to the ordinary tests:—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16.02	14.28	15.56
Grains of sulphur per 100 cubic feet	31.00	27.00	29.02
Grains of ammonia per 100 cubic feet	—	—	0.15

Mean barometer, 30.15; temperature, 56°.

**DEATH THROUGH INHALING GAS.**—On the 25th ult., Mr. Humphreys held an inquest relative to the death of Elizabeth Palmer, aged 52. Deceased, who was a widow, carried on the business of a chairmaker at 35, Bath Street, Finsbury. On Saturday night, the 16th ult., a lodger named Hannah Elem, upon returning from marketing, found the shop and parlour, which were occupied by the deceased, closed. There was a strong smell of gas, to which Mrs. Elem called the attention of the deceased. On the following day, as the deceased did not make her appearance as usual, a policeman was summoned, and having effected an entrance by raising the window at the rear of the house, found deceased lying partially undressed on the bed, insensible. Both the shop and parlour were charged with gas, and it was with great difficulty that the deceased could be approached. Dr. Pottle stated the death of the deceased, which took place on the 21st ult., was due to congestion of the lungs, caused by inhaling gas. It was stated that the deceased was a person of intemperate habits, and it was conjectured that in turning the gas off in the shop she had by some means broken the pipe, which was found to be injured. A verdict of "Accidental death" was returned.

## Water and Sanitary Notes.

We shall not pretend to extract any crumbs of comfort from the reply of Mr. Selater-Booth to a deputation from the Water Companies, who went to ask that the Government should oppose the second reading of the Purchase Bill of the Metropolitan Board of Works. The President was careful not to commit himself, or the Government, to any particular course of procedure. He would represent, he said, the case to the Government, who would decide on the course to be adopted. Candidly speaking, we do not see how the Government collectively can interfere in the matter. We have little doubt that, on a division, most Members of the Government will vote on the side of the Companies, and a knowledge that this will be the case will probably influence a large number of their followers. But it would be a most unusual course if the Chancellor of the Exchequer, or the President of the Local Government Board, were to rise in his place and ask the House to reject the Bill. If the Government had a measure before the House, or if they could say they intended, some day or other, to deal with the subject, they might very properly oppose this measure. But, under present circumstances, we do not see how they, as the Government, can interfere to stop the progress of a Bill of this kind. That it will be rejected we have little doubt, and for good and substantial reasons. First of all, as Mr. Baxter put it, the Companies have committed no crime; they have always done their best to carry out the obligations imposed upon them by Parliament, and it would be the height of injustice if, now they have attained a prosperous condition, their works should be wrenched from them. The history of every Metropolitan Water Company resembles that of the Kent Company, as told by Mr. Samuda. For the first years of their existence, they paid no dividend at all. Slowly, as circumstances improved, they were enabled to pay a very small dividend; and, after a long period of labour and waiting, they find themselves making profits, which justify the payment of moderately good interest on capital. It is a noteworthy fact, that not one of the Metropolitan Water Companies have ever found themselves in a position to pay the maximum dividend. They are, however, as we have said, at the present time, in a fairly prosperous condition, and hoping that as London extends, and their business develops, their profits may increase. It is at this time that the Metropolitan Board come forward with their project to confiscate their undertakings. Of the injustice of this we think it would be easy to convince the House of Commons. If it could be shown that the Metropolis was likely to benefit in any single particular by the transfer, there might, we may admit, be some reason for allowing the Bill to go forward. But the most sanguine of its promoters, we venture to say, will not assert that any direct benefit is likely to ensue if the Metropolitan Board obtain possession of the works. The sources of water will be the same, the same accidents will attend its collection, its filtration, and its distribution; the same, if not heavier, water-rates will be imposed, and these will be more rigidly collected in advance. No great economy, if any, is likely to result, but it is probable that a great amount of confusion may arise. The vastness of London is a great obstacle to the success of concentration—an obstacle which, no doubt, could be overcome by the experience of years; but, in the meantime, the Metropolis may be subjected to grave inconveniences. There can be no question that the sole desire which actuates the Metropolitan Board is a wish for the profits which are now obtained by the Water Companies, and the larger benefits which may be secured in the future. If this be true, London will wait a long time for cheap water. The majority of municipal water undertakings are carried on without profit, many of them at a considerable loss, but that would not be the case in the Metropolis.

We do not attach much weight to the argument that, supposing the Metropolitan Board to obtain the undertakings, they would be exercising rating powers in very extensive districts beyond their limits. In those districts they would be simply purveyors of water, just as the Corporation of Manchester are to the out-townships, and would acquire no additional powers over those outlying districts, the Local Authorities of which might be trusted to resist any intrusion. We have at present but little hint as to the terms of purchase which may be proposed, supposing the Bill to get into Committee, but it is suggested in some quarters that Metropolitan Water Stock, equal to the present market value of shares, would be sufficient consideration. If such an idea be entertained in Spring Gardens, the sooner the members disabuse their minds of it the better. They would soon be taught different in the committee-room. We, however, still indulge a hope that the Bill will never see a committee-room, in which the Ratepayers and the



Shareholders money would be squandered with a most lavish hand, and to no purpose. Every one acquainted with the subject knows all that would be said on the matter. We do, indeed, read that, supposing the inquiry to take place, some very extraordinary evidence would be adduced on the part of Metropolitan Board of Works, and we can easily believe the statement to be true; but the public are now so accustomed to the vagaries of Chemists and Engineers in connection with the water question, that they pay no heed to them. Previous sewage contamination and moving organisms have ceased to impart terror to the most nervous mind, and turbidity, which cannot be observed except in a column of water two feet in height, alarms no one. We must wait until this day week to learn the decision of the House of Commons on Mr. Samuda's motion, with the expression of a hope that the House will summarily reject a measure entirely uncalled-for, and fraught with danger and injustice.

We must call attention at the present juncture to a publication, just issued, entitled, "An Examination of the Figures and Statements published as the Result of the Analyses of Professor Frankland, D.C.L., F.R.S., on the London Water Supply in 1876 and 1877." By  $\Omega$ . To those who have been somewhat mystified by Dr. Frankland's figures and tables, supposing any one reads them besides students, like the author of this pamphlet, this examination will prove of much interest, and we strongly recommend it to the attention of those who study the scientific side of the Water Question.

The Sunderland and South Shields is one of those lucky Water Companies who can pay ten per cent. Notwithstanding the bad times, they have had a very prosperous year, and are looking forward to still better when a revival of trade takes place.

The Newcastle and Gateshead Company are not quite in so good a case. They pay six per cent., however. The depression of trade has told very strongly against this Company. Notwithstanding the accession of a considerable number of new tenants, the income of the Company has been less in the past than in the previous year. This is entirely owing to the smaller consumption of water by meter, which means a stagnation of industry.

The Leicester Water-Works Company held what may be their final half-yearly meeting on the 18th ult., when a dividend of six per cent. was announced. All the works are in excellent condition, and will be handed over to the Corporation in perfect working order.

The Colne Valley Company are passing through the usual phases of a water company's existence. They have just held their eighth general ordinary meeting, and up to this time the Directors have not been able to recommend the payment of a dividend, and, we fear, it will be several more years before they find themselves in a position to do so.

The South Staffordshire Water Company held their half-yearly meeting on the 21st ult. They, too, suffer, as might be expected, by the depression of trade, but they are still able to pay their five per cent. dividend, and to carry forward a good balance. The prospects of the Company are extremely good whenever trade revives.

**BROSELEY GAS AND COKE COMPANY, LIMITED.**—The annual meeting of this Company was held on Friday last, when a very favourable report and statement of accounts were presented, showing a profit on the year's working of £317, and dividends at the rate of 5 per cent. were declared upon the first and second issues of shares, and a further sum of £100 added to the reserve-fund, thereby increasing it to £400. Notice of discounts upon gas accounts at the following rates has been given for payment within a month:—To consumers of under 20,000 feet, 5 per cent.; 20,000 and up to 60,000, 10 per cent.; 60,000 and upwards, 15 per cent.; to take effect from the 1st of January last.

**ENTERTAINMENT TO THE GLASGOW CORPORATION GAS EMPLOYEES.**—The annual festival of the employees of the Glasgow Corporation Gas-Works was held on the 20th ult. in the City Hall, which was quite filled. The Hon. the Lord Provost presided, and was supported by a number of the Magistrates and Town Councillors, the Managers, and other leading officials. After tea the Chairman delivered an address congratulating the men on their splendid assemblage. He rejoiced that in recent years those men who worked at the retorts had the opportunity of paying more attention to the ordinances of religion, as they were no longer kept working as slaves from morning till night on the Sabbath. At all events, they got a share of that holy day of rest, and he had no doubt that physically, mentally, and morally they were all the better for that relief. He had been pleased to learn from the Manager (Mr. Foulis) that the workmen engaged at the works had within the last few years become much more steady at their employment. That was very satisfactory, because only a few years ago, when the bad quality of the gas was complained of, the cause was attributed to the number of drunken men. He (the Lord Provost) knew that many of the workers were subjected to great temptations to drink by long hours and severe labour. If any of them, however, were in the belief that a glass of whisky would do them good after they had been heated at the retorts, just let them consult any medical man, and he would tell them that whisky was exceedingly injurious. If they took a little meal and cold water it would be far better for them than a glass of whisky. The concert which followed was interspersed with other addresses, and at the close an assembly took place.

\* London: Simpkin, Marshall, and Co. 1878.

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### BRITISH ASSOCIATION OF GAS MANAGERS.

SIR,—Your readers will readily credit the "reluctance" with which you published, in your last issue, the letter signed "George Anderson." The prevailing difficulty will surely be not to conceive how great that reluctance was, but to understand why it was not still greater, sufficiently so to have saved you the necessity of expressing it.

I have no intention of following your correspondent through his very long letter. His motive in writing it may have been the welfare of the Association; but he can hardly be surprised if others fail to recognize the voice of a friend in his violent tirade. The reiterated assurance of disinterested purpose is, to my mind, as suspicious as the magnanimous rejection of honours not proffered.

Had Mr. Anderson tendered his advice to the Committee, it would have received respectful attention, and might have done good; but, in that case, the very small modicum of bread would have had to be separated from the intolerable quantity of sack, and "Greece," "Madame Tussaud," and "Allah" himself must have been put off for another occasion.

I may say, in answer to the remarks in your "Circular," that the Committee are perfectly well aware that, for two years past, the expenditure of the Society has exceeded its income. They recognize, and so do the Association as a body, that this will have to be amended, and the method by which it is to be done is now under consideration. Lack of funds is, in this case, a very small difficulty, and will vanish before the first effort to meet it. A far more vital matter is that the work done by the Association should be of such a character as to merit and secure a continuance of the success which has hitherto attended it. Those who love the Association most will be the last to express content with what it has done, and will most desire its further improvement.

I earnestly hope that the papers submitted will show a steady improvement from year to year, and that the Members will continue to interest themselves in making the meetings still more useful and enjoyable than they have been.

Will you permit me, in conclusion, to express a hope that there will not be a "good deal of correspondence" on this matter? It seems to me that, until the Association, as a whole, assembled at its annual meeting, has failed to meet any difficulty (real or imagined), it is unwise and injurious to invoke the aid of the public press, even though represented by the JOURNAL OF GAS LIGHTING.

Phoenix Gaslight Company, Vauchall, S.E.,  
March 1, 1878.

C. WOODALL.

SIR,—I read this afternoon, with deep regret, your remarks upon a letter of Mr. George Anderson on the affairs and management of the British Association of Gas Managers. I have no time to turn to the letter, and have not read a word of it; but, judging of its tone by your remarks upon it, I cannot help saying I am sorry such a letter should have found a place in your JOURNAL. "It is easier to inflict a wound than to heal a breach," and I am afraid Mr. Anderson has been too precipitate in rushing into print on this subject.

At the moment I can only say that such is the strong interest I feel in the welfare of the Association, that I cannot allow the next number of the JOURNAL to appear without a promise on my part to give the Members my views of the subject, on my return from a professional visit, in reply to the serious charges which, I understand from your article, are contained in Mr. Anderson's communication.

R. P. SPICE.

21, Parliament Street, Westminster, S.W., Feb. 26, 1878.

### GAS-WORKS CLAUSES BILL.

SIR,—I shall feel obliged if you will permit me to say, in your JOURNAL, in reply to many applications I have had for a copy of this Bill, that I have not yet been able to get one myself, but will forward copies to those who have asked for them, immediately I can get them.

A few were distributed on Friday last, but I was too late to get one. I applied again to-day, but was told that no further supply had been received up to that hour—two o'clock.

I have been informed that it is nothing but a consolidation of the Acts of 1847 and 1871.

I have called attention to the recent decisions, that the Act of 1871 is binding upon all the Companies subject to the Act of 1847, whether subsequently incorporated in any special Act or not, and have good reason to expect that some provisions may be inserted in this Bill to obviate any difficulty upon this point for the future.

W. LIVESEY.

Gas and Water Companies Association, 6, Victoria Street,  
Westminster, S.W., March 2, 1878.

### THE MANCHESTER CORPORATION AND THE THIRLMERE SCHEME.

SIR,—In your issue of yesterday you describe the Manchester Council as "divided into Thirlmerites and anti-Thirlmerites"—a description which, though strictly accurate, would give outsiders an imperfect idea of the situation. The City Council of Manchester consists of 64 members, and I believe two gentlemen only voted against the Thirlmere scheme in a full house—I am not sure whether there were not 60 present; so that, if, in the sense of cutting off a dog's tail, the animal may be said to be divided, the Council of Manchester are so divided as respects Thirlmere.

Cannon Street, E.C., Feb. 27, 1878.

J. FOX TURNER.

### SALE OF THE STRATFORD-ON-AVON GAS-WORKS.

SIR,—Among what are denominated as "Passing Events," may now be recorded in your columns the fact that the death-warrant of another successful Gas Company has this day been signed, in the good old town



long celebrated throughout the civilized world as the birthplace of the immortal Bard of Avon.

And, to the credit of the Local Authority of the borough, let it be known that, in this case, as in that of Blackburn, there was no attempt at depreciating the value of the undertaking before buying it. Both parties obtained the best advice they could get, and frankly and openly acted upon it without wrangling or chaffering—the Company agreeing to sell, and the Local Board to buy, without a disagreeable word, both being satisfied.

"*Exitus acta probat.*"—"The evening crowns the day."—Ovid.  
"All's well that ends well." "As you like it."—Shakespeare.

R. P. SPICE.

21, Parliament Street, Westminster, S.W., Feb. 28, 1878.

### ANALYSIS OF AUSTRALIAN SHALE.

SIR,—In your last number I observe an analysis of "Hartley Mineral," or Australian Boghead, made by Mr. Alfred Kitt.

Your readers may be interested in the following analysis, which I made of this Mineral in January, 1866, especially as I have reason to believe that it was the earliest examination made in this country:—

Specific gravity . . . . .	1.196	
Ash . . . . .	35.89	per cent.
Coke per ton . . . . .	770	lbs.
Purified gas per ton . . . . .	12,500	cubic feet.
Crude gas contained—		
Sulphuretted hydrogen . . . . .	0.8	per cent.
Carbonic acid . . . . .	1.1	per cent.
Purified gas contained—		
Matter condensed by bromine . . . . .	32.2	per cent.
Illuminating power of gas . . . . .	44.21	sperm candles.

Liverpool Gas Company, March 1, 1878.

WILLIAM KING.

## Parliamentary Intelligence.

### HOUSE OF LORDS.

TUESDAY, FEB. 26.

Bills committed:—Batley Corporation Water; Bedlington Local Board Water; Burton-upon-Trent Commissioners; Castleford and Whitwood Gas; Castleford Local Board; Exeter Corporation Water; Exeter Gas; Forfar Water; Lichfield Gas; Normanton Gas; South Staffordshire Water; Trowbridge Water; York United Gas.

THURSDAY, FEB. 28.

Bill reported with amendments:—Deal Water.

The Batley Corporation Water, Exeter Corporation Water, Exeter Gas, and Lichfield Gas Bills were referred to a Select Committee, consisting of the Marquis of Ripon (Chairman), Earl Waldegrave, Earl Cottenham, Lord Ventry, and Lord Montagu of Brandon; to meet on Tuesday, March 5.

The Bedlington Local Board Water Bill was referred to a Select Committee, consisting of the Duke of Bedford (Chairman), Earl Stanhope, Lord Lyttelton, Lord Sudeley, and Lord Romilly; to meet on Tuesday, March 5.

FRIDAY, MARCH 1.

The Chairman of Committees informed the House that the opposition to the Burton-upon-Trent Commissioners Bill was withdrawn.

### HOUSE OF COMMONS.

MONDAY, FEB. 25.

The Examiners reported that Standing Order 62 has been complied with in the case of the Weston-super-Mare Improvement Commissioners Bill.

Bill read a second time and committed:—Limerick Corporation Gas.

The following petitions against the Brading Harbour District Gas Bill were withdrawn:—(1) Sandown Gas and Coke Company, Limited, (2) Shanklin Gas Company, Limited, (3) Shanklin Local Board, (4) Inhabitants, owners of property, and ratepayers of Brading.

The *locus standi* of the following petitioners was disallowed:—Brading Harbour District Gas Bill, of Sandown Local Board; Cheltenham Corporation Water Bill, of (1) Great Western Railway Company, (2) Mary Lawrence, (3) Charlton Kings Local Board, except as against so much of clause 45, so far as it affects the construction of works within the district of the Board, and against clauses 76 and 77; South Hants Water Bill, of Inhabitants of South Stoneham Rural Sanitary District.

METROPOLIS WATER-WORKS (PURCHASE) BILL.—The Sheriffs of London and Middlesex appeared at the Bar of the House, and presented a petition from the Lord Mayor, Aldermen, and Common Council of the City of London against certain clauses of this Bill, and praying that, in the event of its being read a second time, it should be referred to a Select Committee.

ASSESSMENTS ON WATER-WORKS.—Mr. McLaren gave notice that in Committee on the Roads and Bridges (Scotland) Bill he would move the following clause:—"All the reservoirs, aqueducts, and underground pipes of any water company, trustees, or other persons acting under the powers of an Act of Parliament for the supply of water, shall, for the purpose of assessment under this Act, be held to be of the value of the nearest aggregate sum of pounds sterling to one-fourth of the annual value thereof entered in the valuation roll."

TUESDAY, FEB. 26.

A petition against the Manchester Corporation Water Bill was presented from the Corporation of Wigan.

The petitions against the following Bills were withdrawn:—Bradford Water and Improvement, of (1) Clayton Local Board, (2) Cleckheaton Local Board, (3) Windhill Local Board, (4) Leeds and Liverpool Canal Company; Durham Water, of North-Eastern Railway Company; Nottingham Improvement, Gas, and Water, of Midland Railway Company; West Houghton Local Board, of Lancashire and Yorkshire Railway Company.

The Bournemouth Gas and Water, Newbury Borough Extension, and South Hants Water Bills were referred to a Select Committee, consisting of Mr. Ellice (Chairman), Sir Henry Peek, Mr. C. Praed, and Mr. Barran; to meet on Tuesday, March 5.

The Cheltenham Water, Cheltenham Corporation Water, Shrewsbury Gas, and Weston-super-Mare Improvement Commissioners Bills were referred to a Select Committee, consisting of Sir Lawrence Palk (Chairman), Marquis of Lorne, Mr. Lewis Starkey, Mr. Ernest Noel, and Sir John Duckworth (Referee); to meet on Tuesday, March 5.

The Bangor Local Board, Bangor Water and Gas, Cardiff Water, and

Tredegar Water and Gas Bills were referred to a Select Committee, consisting of Mr. Pease (Chairman), Mr. Carpenter Garnier, Mr. W. E. Denison, and Mr. Biggar; to meet on Tuesday, March 5.

The Cockermouth and Workington Water, Durham Water, and Farnworth and Kearsley Gas Bills were referred to a Select Committee, consisting of Mr. Assheton (Chairman), Mr. Wm. J. Legh, Mr. Colman, Mr. Fay, and Mr. Bonham-Carter (Referee); to meet on Wednesday, March 6.

WEDNESDAY, FEB. 27.

A petition for dispensing with Standing Order 129 in the case of the petition of the Corporation of Wigan against the Manchester Corporation Water Bill, was presented from Messrs. Sharpe, Parkers, Pritchard, and Sharpe.

The petitions against the following Bills were withdrawn:—Farnworth and Kearsley Gas, of London and North-Western Railway Company; Nottingham Improvement, Gas, and Water, of Great Northern Railway Company; Southport Water, of Lancashire and Yorkshire Railway Company.

The *locus standi* of (1) James Berry, (2) Farnworth Local Board, against the Farnworth and Kearsley Gas Bill, was disallowed.

THURSDAY, FEB. 28.

A petition for additional provision in the West Houghton Local Board Bill was referred to the Examiners.

The petitions were withdrawn of Midland Railway Company against the Bradford Water and Improvement Bill; and of Cleveland Gas Company against the Marske and Saltburn Gas Bill.

METROPOLIS WATER-WORKS (PURCHASE) BILL.—Mr. Samuda gave notice that on the second reading of this Bill he will move "that it be read a second time upon this day six months."

FRIDAY, MARCH 1.

The following resolution, reported from the Standing Orders Committee, was agreed to:—"That, in the case of the Manchester Corporation Water Bill, petition of the Corporation of Wigan, for dispensing with Standing Order 129 in the case of their petition against the Bill, the said Standing Order ought to be dispensed with."

On the motion of Sir Charles Forster, the order for the second reading of the Cleveland Gas Bill was discharged, and the Bill withdrawn.

The petitions were withdrawn of Lancashire and Yorkshire Railway Company against the Bradford Water and Improvement Bill; and of South Stoneham Rural Sanitary Authority against the South Hants Water Bill.

METROPOLIS WATER-WORKS (PURCHASE) BILL.—Sir James M'Garel-Hogg gave notice that after the second reading of this Bill he will move, that it be referred, together with the Metropolis Water Supply Bill, to a Select Committee, four to be nominated by the House, and three by the Committee of Selection; five to be the quorum.

## Legal Intelligence.

### HIGH COURT OF JUSTICE—CHANCERY DIVISION.

WEDNESDAY, FEB. 20.

(Before Vice-Chancellor Hall.)

LEAMINGTON CORPORATION v. OLDHAM.

Mr. ROBINSON, Q.C. (with him Mr. WILLIAM BARBER), in opening the case, said the plaintiffs were the Mayor, Aldermen, and Burgesses of the Borough of Royal Leamington Spa, and the defendants were the Contractors to the Local Board of Health (to whom the Corporation were the successors), for the supply of water to the town. The Contractors, he said, had, by their contract, agreed to cause all the water supplied to the Local Board to be properly cleansed and filtered, and freed from impurities, and the plaintiffs asked a perpetual injunction restraining the defendants from causing or permitting water from a certain culvert, or any other source, to be pumped into the source of the water supply, so as to be furnished to the inhabitants, unless it were properly purified. He said it was hardly contended that the defendants had properly performed their contract, and there could be no doubt that part of the water supplied by them to the town of Leamington had not been passed through the filter-beds. The main defence was that, for a long series of years, the water supplied by them had not been passed through the filters, and that this was well known to the plaintiffs and their predecessors. Of course, he could not ask for anything more than an injunction in the terms of the notice of motion, and when his lordship had heard the evidence he thought he would come to the conclusion that the plaintiffs were entitled to it.

The VICE-CHANCELLOR (addressing Mr. Hastings): Do you claim the right to take the water down the culvert from some other source, and pass it into the channel, which goes into the reservoir, without it going through the filtering-beds?

Mr. HASTINGS, Q.C.: No, my lord; and I shall show your lordship from their own reports that, from 1872, they knew that the spring of which they now complain was used upon an occasional emergency. The moment they objected, and said we were not to use it any more, we said we would not, and have not done it.

The VICE-CHANCELLOR: The substance of the case is whether the plaintiffs are entitled to an injunction, the defendants saying that they are willing to do what they were ready to do before the action. It may be that you may be entitled to costs without the injunction. Having regard to what took place before the action, they avowing that they do not mean to do it now, of course, if they did it after that avowal you would have a very speedy remedy. If it was expressed in the order, they might question the order, or appeal from it; but they alleging that they do not mean to do it, and have not done it since a certain time; and, admitting that they are not entitled to do it, if an order is made in that way, you would be amply protected against anything in future. Then it resolves itself into a question of costs.

Mr. HASTINGS: It has always been a question of costs.

Mr. ROBINSON: It has been a question of injunction. The plan we produce shows that there was a gross attempt to evade their obligation.

The VICE-CHANCELLOR: All we have to determine now is, having regard to what is explained, whether at the time the action was brought the plaintiffs were justified in bringing it.

Mr. ROBINSON said it seemed to him that the evidence upon that point was very clear, and he would, first of all, refer to the affidavit of Mr. Passman, the Town Clerk of Leamington, who stated that, for some months, a great many complaints had been made by the plaintiffs as to the supply of water to the town by the defendants. The Surveyor had reported to the plaintiffs on the state of the water supplied, and on May 8, 1876, he reported that unfiltered water was being supplied. In consequence of this he was directed to write to the defendants, stating that, by their continued neglect, they were not carrying out their contract. He also informed the defendants that, from a report of the Board, it was impossible that they could be carrying out their contract, and that a large amount of water pumped into the reservoir was not filtered at all. On the 20th of



January last year a correspondence again commenced, and Mr. Passman wrote to say that an analysis of the water being supplied showed that it was unfit for drinking purposes. The analysis was made by a public analyst, and showed that a considerable portion of the water supplied to the town contained decayed vegetable matter; that the water was in a most deplorable state, and that there was no reason why filtration should be so imperfectly performed. On the 17th of February, the Town Clerk sent a letter to the defendants, inserting a report by the Board Surveyor, to which, in reply, the defendants said they were prepared to give a satisfactory explanation of any of the complaints, made in the Surveyor's report, as to the state of the water supplied to the town.

The VICE-CHANCELLOR said he was not trying the quality of the water.

Mr. ROBINSON replied that it showed justification on the part of the Town Council in taking the proceedings.

The VICE-CHANCELLOR said it would not be contended that the water ought not to be perfectly pure.

Mr. ROBINSON supposed not. He then read an affidavit of the Borough Surveyor, who said he was well acquainted with the position of the water-works of the defendants, which supplied water to the town under the contract; that in consequence of numerous complaints being made by the inhabitants, he had on many occasions called the defendants' attention to the fact that the water supplied to the town was not properly passed through the filter-beds; that when he examined the filter-beds he found them in a very unsatisfactory state, and that nearly the whole of the water being supplied was unfiltered. The excuse was that sufficient water could not be passed through the filter-beds. Mr. William Thursfield, a physician at Leamington, gave corroborative evidence by affidavit. Among the affidavits which had been filed by defendants was one by Mr. John Oldham, who said that on June 3, 1856, a contract was entered into to supply the town, and the filter-beds were completed in July, 1869. They were certified by the Engineer to be sufficient, and the two reservoirs were constructed according to approved plans. From the increase of the population of Leamington, and the additional quantity of water required for the town and the neighbouring parishes, the storage room was insufficient. The plaintiff's attention had often been called to the insufficient size of the reservoirs, but they had made no outlay for the purpose of increasing them. In times of floods and heavy rains it was found difficult, from the insufficient storage for the water, to filter it as well as it would otherwise have been done, and that water from the spring now complained of had been used for the supply of the town for nearly 40 years. When it was objected to he said in future water should not be supplied to the town from that spring, and none had been since May last; nor was it intended to do so in future. Then there was an affidavit by Mr. John Henry Oldham, one of the defendants, who said that on the 26th of May last he turned off the water, and no water had been used from the source objected to since that time.

The VICE-CHANCELLOR said there was a body of evidence to show that the defendants were sending water down to the reservoir which was not filtered.

Mr. HASTINGS replied that on the 26th of May last they heard the first objection, and then it was stopped. He read an affidavit of Mr. Thomas Willis, an engineer in the employment of the defendant, who said he knew the works when they were first put into operation in 1859, and it was impossible but that the town officials must have known of the supply of water from the spring now complained of. He also read an affidavit of Mr. Alfred Hill, an analyst, to the effect that the water taken from the old spring, near Leamington Priors, was impure. There were also other affidavits as to the purity of the water, one by Mr. Goodchild, who had resided in Leamington for eleven years.

Mr. ROBINSON then read affidavits in reply. One by William Warwick, a blacksmith, who said he had for upwards of twenty years past been employed in laying and altering water-pipes in Leamington, and knew the exact position of nearly every water-main in the town. He remembered many years ago the town of Leamington being supplied from the Old Mill spring. There was also another affidavit by Mr. Davidson, the Borough Surveyor, saying that he recommended an additional reservoir to be constructed, to prevent the necessity of the defendant pumping water on Sundays. He also suggested that the defendant should construct a fourth filter-bed, so that three should be in use at one time, which was absolutely necessary for the supply of the town. On the 16th of June last he saw defendants at the water-works, and found that the water flowing into the reservoir was unfiltered. There were some affidavits as to the purity of the water, one of the deponents saying that in pouring some water into a tumbler he found a live eel.

Mr. HASTINGS: The gentleman put it into the tumbler himself. He read an affidavit of Mr. Walter H. Glenney, C.E., and others, who spoke as to the insufficiency of the storage room, and also an affidavit of the defendants, admitting that they had supplied unfiltered water in times of flood, owing to the want of proper storage.

The VICE-CHANCELLOR: That admits the plaintiff's case.

Mr. HASTINGS: No, my lord; because we say it was known to the plaintiffs, and we say that, until we were forbidden on the 26th of May last, we were entitled to use it; that when we were forbidden, we undertook not to use it, have never used it since, and that action was not brought till the following month of June.

Mr. Robert Davidson, examined by Mr. ROBINSON.

I have prepared a plan of the shaft into which the culvert empties, which I now produce. It is drawn to scale, and represents how it is now. The wall around the shaft is 4 feet 6 inches above the ground, and it is open at the top. An alteration was made in it in the six months preceding the commencement of the action. I could not tell the exact time. It used to have a cover. That has been taken off, and it has now a separate wall around it. That has a gate in it. The floor, so far, was put on since the action was commenced. The first alteration was made perhaps more than a year ago. The roof was taken off the shaft. I went there in March last; I went several times in that month. I noticed a difference in the shaft on the 17th of March. I found the defendants had put a wooden floor or cover to the shaft, 6 inches above the level of the main. That is shown upon the plan by a yellow line. The cover is a flat one, with a handle underneath the floor; there are three openings. The floor conceals the openings. One is the inlet from the culvert that comes from Welch's meadow; the one opposite is the outlet of the river, and the one in the middle is the outlet of the pump. The outlet of the river has a flap, or penstock, upon it.

By the COURT: When you loosen the chain it shuts the outlet.

Examination continued: That can be worked up and down without raising the floor. The outlet of the pump is worked by a sluice-valve. That is opened and shut by a rod and a spanner key. The spanner key is loose, and can be put in and taken out, as may be desired.

By the COURT: That is the outlet to the pump. The inlet to Welch's meadow is always open.

Examination continued: By closing the valve which goes to the river, and opening a valve which goes to the pumps, the water can be sent up to the pump, and vice versa. If you close both the water will rise in the shaft, and go through and overflow a little higher up. That can be worked without raising the floor. During the last six months I have been there

three or four times a month. I have seen the spanner key lying on the top of the floor in the corner. It has always been there when I have been there. There is a door leading to this under the wall. It has a lock and key to it. The key of the lock is taken away. When I have visited the works, I have asked for the key to open the flap, but it would be an easy matter to jump over the wall and open the flap. The spanner key could be worked by leaning over the wall. I should say you could lean over the parapet and undo the chain. I have prepared a plan to scale showing that. The culvert runs from the bottom of the main upwards to the shaft. At the shaft it runs either straight forward on to the river, or else right up to the pumps, and that shaft is on the defendant's premises. There has been no cover to this shaft since the action was commenced. The shaft is entirely open. Before the 17th of March it was open right down to the bottom, so that any person could see which way the water was going. They cannot see that now. It would take a couple of minutes to turn on the culvert water, either to the river or to the pumps. The size of the bore of the pipe leading to the pumps is 7 inches. With a considerable amount of pressure it would not take long to fill the reservoir with water. It could be done in 24 hours. Water comes from Welch's meadow along the culvert into the shaft. If the door connecting the shaft with the river were closed, and the valve opened to the pumps, the water would flow direct to the pumps without passing through any filter at all. Then having got to the pumps, it would be pumped direct to the reservoir through the pipe. That pipe is 134 feet high. It runs in an easterly direction to the south of the filters. The use of the overflow would be that, when the flap was shut and the sluices of the pumps opened, there might be a freshet of water, and the water which then rises under the shaft overflows and goes to waste. The overflow is merely to meet the case of a great influx of water.

THURSDAY, FEB. 21.

Mr. R. Davidson recalled, and further examined by Mr. ROBINSON.

There are two communications between the settling-tank and the culvert. The water from the Leame, which passes by the inlet into the settling-tank, passes out by means of these two communications into the land drain, and then passes by the land drain to the mill. The water by one communication passes through a filter, but by the other it does not. There are also certain side drains which run into the land drain. I have investigated these side drains. The main drain is about four feet deep, and the side drains run to about 14 inches from the top end. Where the side drains fall into the land drain they are about level. I saw at two places the water coming in from the side drains to the land drain. I made this investigation in July, 1877. Welch's meadow is about level with the surface of the river. There is no spring in that meadow. The side drains are placed at right angles to drain the meadow, and were placed there by the tenant of the meadow. The meadow is liable to be flooded at times from the river, and when not flooded it is used for grazing purposes. Agricultural shows are occasionally held there. I first knew that water from the culvert went into the pumps in 1872. The defendants told me that this was the original spring called "Saggey Barn," which supplied the town with water. I never heard of any spring except this in connection with the culvert. I did not know that Saggey Barn had been cut off in 1872; I first heard of this having been done in January, 1877. In that month I visited the works, and saw water flowing from the land drain, and told the defendants that I was informed the water came from Welch's meadow and not from Saggey Barn, and they admitted it. I immediately returned to my office and wrote them a letter to that effect. From January to May I continued to object to water being supplied from the culvert. Up to May the defendants had not promised to discontinue this. The statement by the defendants that they promised to do so on the 26th of May is not true; I did not see them on that day. If such a conversation had taken place between us I should have made a note of it, and brought it before the Town Council. On the 11th of June I saw Mr. John Oldham at the shaft. I observed to him that they were not taking any water from the land drain, and he said they were not. I asked him whether they ever drew any, and he answered that they sometimes took a little at night. I advised him not to do so. That was the whole of the conversation. It is not true, as stated by the defendants, that this conversation took place on the 26th of May. "Saggey Barn" is known by the name of the Old Mill spring, but by no other names.

Cross-examined by Mr. HASTINGS: I became Surveyor to the plaintiffs in March, 1870. I had had experience of water-works before that time—namely, at Liverpool and Manchester. I was Assistant-Engineer, and had the water-works to look after. I made a report to the Corporation on Dec. 17, 1872, and my inspection, upon which the report was founded, was made shortly before that time. I know that the auxiliary filter mentioned in that report existed in December. The statement in the report, that the defendants used the spring from which the whole town supply was formerly taken, referred to Saggey Barn. I did not know that Saggey Barn had been cut off for some years. I did not, before July, trace the land drain to its termination. I knew nothing about Leamington until I went into the service of the Corporation. I do not know that the Saggey Barn and the Old Mill spring are distinct springs. I do not know that the Corporation paid the executors of Thomas Oldham, the father of the present defendants, a separate sum of money for each spring. On looking at the award, dated July 9, 1850, I see the sum of £21 was paid for the Saggey Barn, and £490 for the Old Mill spring.

The VICE-CHANCELLOR asked what the award had to do with the question.

Mr. HASTINGS submitted that it had a great deal to do with it. An attempt had been made to show that there was a scheme for supplying water through some improper source, which was totally untrue. An attempt had also been made to prove that there was only one spring, which had been cut off for some time; but the award clearly showed that there were two springs, and the Old Mill spring was of more value than the Saggey Barn, as shown by the amount paid.

The VICE-CHANCELLOR said he did not think that was an answer to a breach of the contract.

Cross-examination continued: It is impossible for the water coming from the settling-tank, through the two communications, to get into the pump without passing through the outlet of the pump. If the spanner-key is removed from the shaft, the water could not pass. I do not recognize the keys now produced. I have never tried to open the sluice with the smaller key, but I imagine it was the key of the sluice from seeing it lying in the corner. The mill shaft was at one time covered with a wooden cover, but I do not know whether the cover was taken off to give more room in the yard for waggons to turn. When I made my examination in March, 1877, and found the water coming from the culvert, the river was more or less in flood. If the sluice was shut, and the key removed, no water could flow from the culvert into the pipes. I say no conversation took place between the defendants and myself as to discontinuing the supply from the culvert. I have told the defendants that it was a wrong thing to use the water which came from the land drain, but they never said they would discontinue the use of it. The conversation on the 11th of June took place about ten o'clock, in the mill yard, in the presence of Mr. Duke. There was a Town Council meeting on the



same day, when instructions were given for these proceedings. I fancy Mr. John Oldham was present at that meeting, but I did not speak to him. The interview at the mill lasted only a minute or two. I examined the filter-beds, the settling-tanks, and the shaft on that occasion, and no doubt I saw the spanner-key there. I saw Mr. Oldham close to the shaft, and I then said to him they were not taking water from the land drain. I lifted the cover, and saw the water was flowing direct into the river. The water was about half way up the little flap which forms the outlet to the river; the outlet was open, and I could see that there was no flow of water to the river. The Council acted on June 11 upon the report of my various visits, but I did not report the conversation I had had that morning with Mr. Oldham. I did make a report of my visit to the works on that day. The report now produced is in my writing; it states that during the past month I have visited the mill four times, and on three of those visits no water was being drawn from the land drain, that the whole of the water supplied to the town came apparently from the filter-beds. On the fourth occasion—the 26th of May last—the water was flowing into the pumps from the culvert. I did not make any remark about it to any one representing the defendants.

Mr. John Duke, examined by Mr. BARBER.

I am the foreman of the water-works belonging to the Corporation. It is my duty to inspect the works daily, and to measure the quantity of water at the reservoir. I have held that appointment for four years. I know Welch's meadow; it is liable to be flooded by the river. I know the shaft in the defendant's yard. I remember some alterations being made previous to January, 1877. On the 11th of January I visited the shaft; the roof was off. I looked into it, and saw that the water flowing was very dirty. I asked whether the muddy water was flowing into the pumps, and was informed that it was, and I then told Mr. Davidson. I did not know before then that water passed from the shaft to the pumps. Prior to this time complaints had frequently been made about the condition of the water. I was under the impression that the water came from Saggey Barn, but the defendants said that it came down from the meadow. I complained about their using this water. On the 17th of March a cover was put on the shaft. I remember being present at the works with Mr. Davidson on the 26th of May. Mr. Oldham was not present. I fetched the key, opened the door, pulled the lid up, and looked into the shaft. I saw the water was coming down Welch's meadow, and flowing into the pump; it was also flowing into the river. The penstock was open a little way. I remember visiting the yard on the 11th of June. Mr. Davidson was with me; I saw Mr. Oldham. I examined the shaft, and saw the water flowing into the river; the penstock up and the sluice down. Mr. Davidson made a remark to Mr. Oldham—that they were not taking the water from the culvert, and Mr. Oldham said they took a little at nights. Mr. Davidson said he would advise them not to do so. He made no answer. I took a note of this interview, and of Mr. Oldham being present. I have no note of seeing the defendants between May 26 and June 5. This conversation did not take place on the 26th of May.

Mr. HASTINGS said the memorandum referred to by the witness must be put in, having been made evidence.

It was put in accordingly, and Mr. ROBINSON read the entry on the 26th of May.

Examination continued: I have not seen the long spanner key produced in Court before. I have seen one lying about similar to the shorter one produced. I cannot tell whether the sluice is opened by a long spanner key, or a short one working on a long rod reaching down the valves.

Cross-examined by Mr. HASTINGS: I did not know this place, and never went over the premises until I entered plaintiffs service. On the 26th of May it was about ten a.m. when I went to the works. I was about ten minutes inspecting the filter-bed, &c. The key of the gate was hung up in the office, and could be had at any time. I could not tell how far down the spanner key reached. We have never taken up the boards. I have never seen a key projecting above the boards. I do not know whether the short key would fit on the nozzle of the sluice-valve; I never tried it. I never saw it used, only lying about. On the 26th of May I did not see Mr. John Oldham early on that morning. I speak from my note, and from my recollection, apart from the note. I made the note at the time, on leaving the works, either in the street or on going back to the office. I believe I always made a note, whether Mr. John Oldham was present on the occasion of my visits. Looking at my notes, I find I have always done so. On the 26th of May Mr. Oldham's nephew was present, I believe; I did not say anything to him about the water running from the culvert. I was at the works on the 19th of May; Mr. Oldham was not there, nor was he on the 5th of June. On neither occasion was the water flowing from the culvert into the pumps. I have no note in my book of the conversation on the 11th of June; I only speak to it from my memory. The conversation could not have taken place on any other occasion. On the 26th of May the shutter D was a little open. I do not know that it must be either shut or entirely open. When the water was running there was a flood.

Re-examined by Mr. ROBINSON: The water could not have been turned on to the pumps without a key of some kind. The object of the shaft was to turn the water on.

William Warwick, examined by Mr. ROBINSON.

I am a blacksmith, residing at Leamington. I have been employed by the old Local Board of Health, and by the present Town Council, in repairing and altering the mains. The town used to be supplied with water from the "Saggey Barn." There was another spring, or what they called a spring, but where it came from I did not know until lately. It comes down at the back of Leame Terrace. The water was brought from Saggey Barn by a 4-inch iron pipe, under the river across the fields, and to Leame Terrace East. I remember being ordered to take it up from the river across the fields. The water from Saggey Barn then ran into the river. The pipes down which the water used to flow at Leame Terrace were used as pipes to supply the town.

Cross-examined by Mr. HASTINGS: I was there in 1859 when the supply was cut off. The town was also supplied from a spring called the Old Mill spring; but I never searched where it came from. I cannot say whether the Old Mill spring produced more water than the Saggey Barn. I had no written instructions to cut off the water from the Saggey Barn. My instructions came from Mr. Pearson, the Assistant-Surveyor. He was with me when I did it. The water from the Saggey Barn could not have come to the town since the pipes were taken up. It was well known at the time.

Re-examined by Mr. ROBINSON: The water from the Old Mill spring flowed into the same well in the yard. It came down by the side of the main. I do not know where it came from. I have never seen the well or shaft empty. I do not know whether the bottom is cemented. About 17 years ago I broke into the drain about 50 yards from the shaft.

Thomas Evans, examined by Mr. BARBER.

I am an engine-driver, and have been about 29 years in the defendants employment. I left them in July, 1876. My duties were to superintend the engine. I know the shaft in the yard. I had to manage the valves in the shaft. When water was wanted we turned it from the shaft into the pumps. It did not pass through the filtering-beds. It was often done—whenever the water was clear, not when it was dirty. The long spanner

key produced is the one we used for turning it on, but the top of it has been altered.

Cross-examined by Mr. HASTINGS: I was with the plaintiffs in 1847, when the town was supplied from the Saggey Barn and the Old Mill spring which came down the culvert. They both came into the shaft in the yard, and were then pumped up to supply the town. That was before the contract for the new filter-beds. I used to shut off the water when it was dirty. There was more water required in summer, that is why it was used.

Mr. ROBINSON tendered Dr. Sweet as a witness, to speak to the analysis of water; but he was not examined, as that point was no longer in dispute.

Mr. GRAHAM HASTINGS then addressed the Court for the defendants. He said the question was now narrowed to this—whether, at the time of the commencement of the action, such a state of circumstances existed as justified the plaintiffs in bringing it, and in now asking for the costs. No evidence had been given or suggestion made that, at the time the action was brought, any unfiltered water was being used; and the evidence he should adduce being clearly to the contrary—that it had not, and could not in future be so used—he contended that the plaintiffs were not entitled to the costs. This was not a case of secret and improper use of unfiltered water, but it arose under circumstances which must have been foreseen at the time of the contract. The town of Leamington had been supplied from 1832, up to the date of the contract, with water from two springs—the Saggey Barn and the Old Mill spring. In 1832 the late Mr. Thomas Oldham (the father of the defendants) was lessee of these two springs (the Old Mill spring supplying 60 gallons per minute, and the Saggey Barn 10 gallons), and he entered into a contract to supply the town with water, which was not filtered in any way. That went on till 1849, when Mr. Thomas Oldham died; and, in 1850, the Town Commissioners bought from his executors his interest in the springs, paying £492 for the Old Mill, and £21 for the other, thus distinctly proving, not only that there were two distinct springs, but their relative importance. In 1856 the contract with the defendants was made, and under this the plaintiffs sued. In 1859 the works were completed, and notice was given by the Local Board to the defendants to supply water under the contract. On this the previous contract was determined, and the supply from Saggey Barn was cut off, as described by Warwick, and from that time it must have been known to the plaintiffs or their predecessors that no water could have come from that spring to the pumps. For some reason or other, however, the Old Mill spring was not cut off—it remained as it was—and, in 1872, the report of the Inspector actually recognized its existence, and stated that it was used occasionally when an extra supply of water was required. It was true Mr. Davidson afterwards said he had made a mistake, and that he alluded to the Saggey Barn; but, under the circumstances he had mentioned, there could be no excuse for such a mistake. He did not mean to say that defendants were to escape the burden of their contract by using this spring; but the use of it really arose in consequence of the Engineer of the Corporation having miscalculated the amount of storage capacity for the water required, and, in consequence, calling on defendants to supply more than the maximum stipulated in the contract. That maximum was half a million gallons daily; but on the 31st of May Mr. Robert Davidson gave the defendants notice that they were to supply 600,000 gallons daily, and in July he required 650,000 gallons. He suggested that this action was really an attempt to compel the defendants to supply more water than they were required to under the contract, and the lever used to force them to do that was the very means they had adopted to enable them to comply with these requests, and which, up to July, they did comply with. That was the key to the way in which the matter had been dealt with. These orders having been given for an amount exceeding the maximum they were bound to supply, the defendants could not suppose that the plaintiffs meant to cut them off from the particular supply which had always been used for extra purposes, and, therefore, they went on in the way in which they had been going on; and owing to the floods, which were so universal at that time, it was impossible for water to remain long enough to settle and become clear. The evidence which had been given, however, as to impurities, referred to places for which the defendants were not liable—viz., in the houses of the consumers, where a decomposed eel and a leech had been found. Having referred to the question of the spanner key, and stated that about 18 months ago an alteration had been made in the arrangements, in consequence of which the short key was thrown aside, and had never been used since, the long one being substituted for it, the learned counsel quoted from Mr. Oldham's affidavit his statement that on the 26th of May he gave an assurance that they would not in future supply any water from the spring, and that since that date they had not supplied any other water than that from the river Leam. On the 20th of May, which was market-day at Warwick, on his return from the market, he told his nephew to remove the spanner key, which was used for turning on the water from the culvert, and on the same evening he removed it to his own house, and there it had remained until it was brought up to the Court. That having happened on the 26th of May, no cause of complaint had since arisen. There were visits by the Inspector on the 5th and 11th of June, and on both occasions no unfiltered water was found running, as indeed it could not, the key which opened the sluice having been removed. What possible justification was there, then, for bringing the action? The writ was issued on the 11th of June, and before that all reasonable ground of complaint had ceased. There might be a possible suggestion that the alleged conversation with Duke on the 11th of June was a ground for it; but Mr. Oldham would deny positively that there was any such conversation at all on that day, but that it occurred on a previous occasion; and all probability was in his favour on this point, because it could not be supposed that, having given an undertaking that they would not do a certain thing, he would afterwards admit to the plaintiffs agent that they had not fulfilled it. But even if it were so, this could not be the cause of the action, because the instructions must be given before the conversation was alleged to have taken place. On the whole he submitted that the plaintiffs had rushed hurriedly into this litigation, and that they ought to bear the costs of it.

The VICE-CHANCELLOR said the question upon which everything would hinge in this case was whether the defendants could satisfy the Court, as a matter of fact, not of inference, that they did, on the 26th of May, make a representation that no water would be henceforward allowed to flow down the culvert until it had passed through the filter. He had read the defendants' affidavit, but he had not heard it suggested that they had any witness to call who was present at the interview, which interview was denied on the other side.

Mr. HASTINGS said he must admit that he had no witness who could speak to the interview.

The VICE-CHANCELLOR said he would assume the defendants stated in the most emphatic way that a conversation took place, in which distinct notice was given by him to the plaintiffs representatives, that as from that time the whole of the water should pass through the filter. Assuming this in his favour, could Mr. Hastings carry the case any higher by any evidence he could adduce?

Mr. HASTINGS said he should call Mr. John Henry Oldham to deny that he was present on the 26th, as stated by two of the witnesses.



The VICE-CHANCELLOR said he would assume that in the defendants' favour. Treating the case in this way, he must determine, as a matter of fact, that this water, coming from some other source—it did not much matter where—which did not pass through the filter-beds according to the contract, but was allowed to flow down the culvert, there was then a clear breach of the contract. The excuses which had been made for it he did not think he was at liberty to attend to. That being so, on the question of fact whether there was a representation and a promise on the part of the defendants that no such water should pass down without being filtered—giving that weight to his positive statement in this respect which their affidavit was entitled to—he could not help thinking that he was under some mistake about it, because such a conversation as he alleged was positively denied by the plaintiffs' witnesses, and he did not think it was one which could have been forgotten. But whether forgotten or not, in this state of the evidence it appeared to him that the defence was not made out. Then it was said that on two subsequent visits the water was found to be all passing through the filter, and that this was corroborative of the defendants' assertion of the promise, and of the carrying it out; but he could not by reason of that come to a different conclusion to what he otherwise should have done, because there might have been other and independent reasons for the defendants so acting, quite apart from their having given any such promise. This being so, the case stood thus: That on many occasions this unfiltered water had been sent down, and the matter was brought before the Town Council upon the occasion of a report being made of its being found to be the case, on the occasion of a visit of inspection prior to the 26th of May. The Town Council seemed to be of opinion that, as there had been frequent complaints, and there was now undoubted proof of a breach of contract having been committed, they ought to give directions to bring this action. He could not say that they were not entitled to do so, or that it was brought under such want of apprehension of the necessity of their taking proceedings as to disentitle them to the costs. He understood that an injunction was not now asked for, but only liberty to apply in case of any subsequent breach of the fourth clause of the contract, and therefore the only order would be that the defendants pay the costs.

Mr. ROBINSON asked for a statement in the order that the defendants alleged they had not sent down unfiltered water since the 26th of May, and would not do it again.

The VICE-CHANCELLOR: Yes; let it be so.

THURSDAY, FEB. 28.  
(Before Vice-Chancellor BACON.)  
HAGG v. ALCOCK.

Mr. HEMMING, Q.C. (with him Mr. RENSHAW), moved the Court for an injunction to restrain the defendant from carrying on business under the style of the Old Government Sanitary Company, or any other resembling that under which the plaintiff traded, so as to lead the public to believe that the said business was the business of the plaintiff, or in any way connected therewith; and from representing that the defendant was the sole proprietor of the Old Government Sanitary Company, or the only person authorized to make Government carbolic disinfectants. He reminded his lordship that he had a motion before him some time ago with respect to the same business. The circumstances were very peculiar. In January, 1877, Darley, who was defendant on the former occasion, in partnership with three other persons, was carrying on business under the style of the Government Sanitary Company, the main part of which business consisted of the sale of valuable disinfectants, called Government carbolic disinfectants. The plaintiff agreed with Darley and his partners to purchase their business from them, which purchase was completed. It was one of the terms (to which effect was given by a contemporaneous deed) that Darley, who knew all about the secret of the manufacture, and who could be of great assistance, should be engaged by the plaintiff for a year after the purchase, in order that he might assist in carrying on the business. The plaintiff carried on the business for some time with Darley's assistance, but, before the year expired, he suddenly left, and set up precisely the same business, assuming the title of the Old Government Sanitary Company. He carried on the same business exactly as the plaintiff purchased from him and his former partners, merely adding the word "Old" at the commencement of the title. When a motion was made to restrain Darley from doing that, there was no defence, and an injunction against him was granted. But now, since the injunction was granted, Darley had formed a connection with the defendant, who was until recently a traveller in the employ of the plaintiff, and was now carrying on business under the same title of the Old Government Sanitary Company, at the premises at Hackney, where the business sold was originally carried on. In fact, the defendant was carrying on the very business which Darley was restrained from carrying on. It was a contrivance of Darley's, if contrivance it could be called, to evade the injunction granted against him.

Mr. RIBTON, for the defendant, submitted that the cases showed the right to the injunction was based upon special contract or tort. The only contract referred to in the evidence was one between the plaintiff and Darley, and there did not appear to be any privity of contract between the plaintiff and defendant at all. The defendant also alleged that his disinfectants were prepared from a recipe of a person totally unconnected with the plaintiff, and were entirely distinct from the preparations of the plaintiff. He also denied the plaintiff's exclusive right to the title of the Government Sanitary Company. Having referred to reported cases, with regard to Condy's Fluid and Thorley's Food for Cattle, he contended that the defendant had made no such fraudulent representation as would entitle the plaintiff to the injunction he asked.

His LORDSHIP said the introduction of the word "Old" was an additional badge of the fraud of which the plaintiff complained. If the defendant imagined that by such devices he could escape the consequences of what he and Darley had done, and were probably doing now, he had made a mistake. He should grant the injunction in the terms prayed.

PETERBOROUGH GAS COMPANY.—At the half-yearly meeting of this Company, the following report was submitted and adopted:—

The Directors herewith submit to the Shareholders the balance-sheet and statement of accounts for the half year ending Dec. 31, 1877, and are glad to be able to present to the Shareholders results so highly satisfactory as those shown therein. Notwithstanding the depressed state of trade, a steady increase in the consumption of gas has taken place during the past half year, but the value of coke having considerably diminished, owing to the reduced price of coal, the receipts under that heading have fallen off to some extent. The balance of the profit and loss account, including £580 14s. 8d., brought forward from last half year's account, is £2927 3s. 10d.; out of this sum, after providing for the payment of the preferential dividend on the £5 per cent. new preference A shares, the Directors recommend the payment of the maximum dividend for the half year on the remaining share capital of the Company, and a back dividend at the rate of £3 per cent. per annum, or 6s. per share, on the ordinary shares of the Company, for the year ending Sept. 30, 1870, free from income-tax, payable on and after the 26th day of February inst., and that the balance then remaining, amounting to £368 18s. 10d., be carried forward to the next half year's account. As pointed out to you in the report of Jan., 1877, it will be necessary to raise further capital, in order to meet the outlay for the extensions therein referred to, and to provide for any future improvements that may be thought expedient. Your Directors, therefore, recommend that £2000 of the additional share capital of the Company be raised by the creation and issue of 900 new ordinary shares of £10 each, to be called "New A Shares."

## Miscellaneous News.

### AVERAGE METER SYSTEM IN THE PARISH OF ST. GEORGE, HANOVER SQUARE.

At the Meeting of the Committee of Works of the Vestry of this Parish on the 12th ult.—Lord FREDERIC FITZROY in the chair—the Gas Sub-Committee submitted the following statement prepared by Mr. C. Livingstone, the Surveyor, showing the actual cost incurred in the introduction of the average meter system of lighting, together with the cost of gas supplied to the public lamps under this system, for the six months ended Dec. 29, 1877, as compared with the cost under the contract system for the corresponding period of 1876:—

#### Introduction of the Average Meter System—First Cost.

Providing and fixing meters and meter-boxes . . . . .	£886 11 0
Providing lever-cocks and governors . . . . .	388 2 6
Making good footway, paving, &c. . . . .	81 18 8
Ladders . . . . .	19 1 0
Lamp-lighters torches and poles . . . . .	19 17 6
Testing apparatus, pressure-gauges, including fixing same and fitting up testing-room . . . . .	96 13 3
Advertising, books, stationery, &c. . . . .	17 2 6
Stock of meters, boxes, governors, regulators, tools, &c., including glass, tin, lamp-columns, &c. . . . .	170 9 7
New stand-pipes . . . . .	14 18 10
Numbers to lamps . . . . .	15 2 3
Sundries, including oil, leathers, &c. . . . .	14 18 7
Engineering fees . . . . .	31 10 0

Total cost . . . . . £1756 5 3

Surveyor's estimated cost . . . . . £1725 16 0

#### Cost of Lighting Public Lamps by the Average Meter System, for the Six Months ended Dec., 1877.

Consumption of gas (including lighting, cleaning, and repairs) —	
Gas consumed by 1725 lamps, as per meter . . . . .	£2118 5 11
Lamp-lighters wages (including inspector's salary) £734 19 5	
Depreciation on first cost, estimated at 10 per cent. per annum for the half year . . . . .	90 0 0
	824 19 5
	£2943 5 4

Credit—	
Sums received for lighting private lamps, repairs, &c. . . . .	123 10 0
	£2819 15 4

Surveyor's estimated cost . . . . . £2985 16 0

#### Cost of Lighting the Public Lamps by the Contract System for the corresponding Six Months of 1876.

Supply of gas to public lamps for six months, including cleaning, lighting, and repairs—	
936 cannel lamps, at £3 6s. 1d. per annum . . . . .	£3083 18 2
772 common do., at £3 19s. 8d. do. for six months } . . . . .	
17 lamps, equal to the present number, at £3 19s. 8d. per lamp per annum for six months . . . . .	33 17 2
1725 total.	£3,117 15 4

Showing a saving in six months of £298 by the present system.

### METROPOLIS WATER-WORKS (PURCHASE) BILL.

DEPUTATION FROM THE WATER COMPANIES TO THE PRESIDENT OF THE LOCAL GOVERNMENT BOARD.

On Monday, Feb. 25, a very large and influential deputation, representing the Chairmen, Directors, and Secretaries of the different Water Companies, had an interview with Mr. Slater-Booth, the President of the Local Government Board, with whom were Mr. Salt, M.P., and Mr. Lambert, at the office of the Local Government Board, to urge objections against the Metropolitan Water-Works (Purchase) Bill of the Metropolitan Board of Works. Amongst those present were Mr. E. Greene, M.P., Sir Thomas E. Colebrooke, M.P., Mr. O. E. Coope, M.P., and Sir Harcourt Johnstone, M.P.

Mr. SAMUDA, M.P., in introducing the deputation, said: I have the honour, sir, to introduce to you this deputation, consisting of the Chairmen and the Directors of the principal Water Companies of the Metropolitan, and, with your permission, I will just put before you shortly the object which they have in view in waiting upon you, and I shall be followed by Mr. Baxter, who will go into the details of the matter, and will explain it to you more fully. You are aware that the Metropolitan Board of Works have before Parliament at the present time two Bills—one a Bill, the principal object of which is to purchase the whole of the Water Companies of London; the other is a Bill by which they seek to justify that course by works that they propose to perform, and inferentially leave it to be supposed are necessary to be performed on the present occasion. Now, the general opinion of the gentlemen present—an opinion which I quite share—is that there is no necessity for these Bills; and the reason that there is no necessity for these Bills they urge to be this—that the Acts of Parliament of 1852 and 1871 really give to the Government a Governmental supervision over the Water Companies. By these Acts Auditors are appointed, and Water Examiners are appointed, subject to the approval of the Local Government Board; and, in addition, I believe, there are in these Acts clauses to be found which enable the Local Government Board, when they think fit, to call upon the Companies for a continuous supply of water, and also even for the placing of hydrants in positions in which they may be required. But more than all that, the Act of 1871 is so stringent in its demands on the Water Companies that a clause will there be found by which very heavy penalties may be enforced, going to the extent of £200 per month, for any deficiency of supply, or any inferiority of quality. These gentlemen say that under these provisions they have never been called upon—I am informed that this is so, and no doubt I am speaking correctly—that they have never been called upon under these Acts for any penalty whatever, and no application has ever been made to them. They have, therefore, a natural right to suppose that they have never placed themselves in a position to deserve that such application should be made. But they further say that, if it had been found necessary at any time to improve the supply beyond that which they are now giving (and I should here point out that they have made very great improvements; I believe that is beyond all doubt, both as regards their sources of supply, and also in matters of filtration, and



other matters which have gone on very largely since 1871), they say that if it had been desired, from any deficiency of theirs, that more stringent legislation should be imposed upon them, they would have been ready to accept such demands, but none have been made.

The PRESIDENT: When it is said that no penalties have been exacted, that is quite correct; but it would not be correct to say that no pressure has been exercised, and that the improvements of which you speak have been effected without pressure.

Mr. SAMUDA: That was not the point that I was aiming at. Whatever pressure has been put upon them, it has answered the purpose so well that the penalties have not been enforced, which they would have been if there had been failure to comply with the demands.

The PRESIDENT: That is quite right.

Mr. SAMUDA: Then they say that there is another great reason why they ought to be dealt with in a far different manner from that which is proposed in these Bills. They say that this is a peculiar state of things. That is to say, that the investments which are made in the Water Companies are by no means speculative investments, but *bona fide* investments, which are made by persons who at the present time have not had sufficient return for the capital invested in the concerns. Just to give one instance which occurs to me, and which comes within my own knowledge—I speak of the Kent Water-Works Company. That Company have been 70 years in existence. For the first 40 years they had only earned an average of something like 1 per cent., and for the last 10 of those years they had earned no dividend whatever. They have gone on gradually improving their position for the last 30 years, and now they have an average of 8 per cent.; but the total average per centage on their capital during all those years is under 3 per cent. If you take that, without any reference to the better results being attained towards the end of their time, and if you make no allowance, you will do great injustice to that Company. I believe it is exactly the same with the other Companies. If they are only just to get a bare return for their capital at present, it would be very unfair, and could not be justified on any ground other than this, that they had committed some great default. The Companies are now just beginning to recoup themselves, and it would be grossly unfair to allow them to be pounced upon, and have their undertakings taken away from them. One cannot help feeling—and in this I thoroughly concur with the deputation—that the scheme by which the Metropolitan Board of Works seek to justify the application to take the Water Companies works out of their hands is thoroughly defective from beginning to end. Now, the Works Bill, when simply described, amounts to this: It proposes, in the first instance, to double the mains through the entire Metropolis—that is to say, to have a complete double set of mains. In the first instance, the whole of the Metropolis will have to suffer the inconvenience of having an entire set of new mains put down, and after a short time they will probably be taken up to be repaired, and thus a fresh disturbance of the streets will take place. That is serious in itself, but it involves double fittings, for they propose that the water for drinking and fire extinguishing should come from one main, and all the other from another main, so that every house must have a double set of fittings. They also propose that, in all the existing houses at the present time, they should place a second set of fittings at their own expense, which means at the expense of the ratepayers; and that every person who subsequently builds a house will have to pay the cost of a double set of fittings, which, if there is no necessity, is an increased expense to the consumer. Well, then, that involves another very serious thing, and it is a very important one with regard to the Metropolitan Board's scheme, that they propose to take this water—what they call their potable water—from the chalk formation on the Surrey side of the Thames. This district is already occupied by one of the very Companies they are seeking to buy up, and they find that there is no supply of water to spare beyond that which their existing and prospective requirements appear to demand. It may, therefore, become a very difficult matter, even if the quantity of water they desire to get should be confined to the small quantity, which they put down, I think, at 11 million gallons per day (I am not certain about the figures)—but if it could be supplied to them they could only get it at the expense of those districts which, at present, take their supply wholly from those wells on the Surrey side. But when we come to this fact, that every house has to be furnished with double fittings, by which it is proposed to give a superior quality of water, is it to be supposed that you will be able to effectually restrict the persons to using the one supply—that which is intended for drinking purposes—for that purpose alone? I think not. If that is the case, then the Board will have to tap this district for such an enormous amount of water that, as I am informed, there would be no chance of getting it. These are the facts. I am speaking not upon my own knowledge, but on the authority of scientific men and engineers who have gone into the matter thoroughly; and I am speaking specially on the authority of an engineer who has had especial practical dealing with this matter—viz., the Engineer to the Kent Water-Works Company, which Company take their supply from the source that I have been speaking about. The next point that suggests itself appears to be this: Supposing that, not having committed any fault, and instead of having anything more said in the Bill than that which the Bill does say—that it is “expedient,” and, therefore, it is proper to be done—that these works are to be sold and bought, without any fair way of fixing the price or any satisfactory arrangement made as to the way in which they are to be bought and sold—supposing it to be admitted, for the sake of argument, are the Metropolitan Board of Works the right authority to purchase them? I think not; and for these reasons: The Metropolitan Board of Works—to say nothing of the duties they were originally brought into existence to fulfil, which were to deal with a totally different state of things to this—do not possess the power within themselves, at the present moment, it appears to me, such as would justify their being accepted as the authority to perform this great work. They would have to deal with an area, if they bought up those Companies, enormously outside their present parliamentary powers. In the case of the south of London, the present supply of water goes down as far as Gravesend; in the case of the New River Company it goes to Hertford; and in the case of many others it goes considerably outside the present range of the Metropolitan district. In one case, of which I have been speaking—that of the south side of the river—they would be taking in 70 square miles of new territory, which would be added to the district for which they at present possess parliamentary power, enabling them to levy rates, and with which they have at present nothing whatever to do, because it is all outside the Metropolitan boundary.

The PRESIDENT: What other places besides Gravesend did you say?

Mr. SAMUDA: Hertford and Uxbridge. Then there is another important matter for consideration, which would be this—that if they bought the Companies which supply the City, there would be too rival Municipal Corporations competing for the supply. No doubt the time will come when some great and general corporation will be brought into existence that will absorb both; but at the present moment, if the Metropolitan Board of Works were created into an authority for the purchase of these water-works, they would have to levy rates in the City; and they would not accept that as a satisfactory arrangement as far as they are concerned, because the City have no means of getting water except from the Water

Companies, who would then be absorbed by the Metropolitan Board of Works. I will leave Mr. Baxter to deal with those questions, which are so serious with regard to the expected increased economy to be effected by the Board of Works, should they take over these concerns. I cannot conceive that there is a single element of economy which can be gained by the passing over of the undertakings of these Companies to the Metropolitan Board of Works. It is a totally different thing when you are dealing with provincial undertakings, where it often happens that, from the smallness of the districts with which you have to deal, by absorbing two or three in one you may gain great advantages by diminishing the expense of separate management, and effecting a decrease in the staff. Not so here, where the Companies are so large that they have no staff to spare; and I think it is not too much to say that, with the experience we have, the Board, if they purchased the Companies, would not only be compelled to adopt the present staff, but a larger staff; and, therefore, you will have no advantage whatever, but only the great disadvantage of having the Metropolitan Board of Works continually acting as the intermediary between the Public and the Water Companies themselves. Now, sir, I think I have put all the facts of the case that I desired before you; and I may say that the conclusions at which we wish you to arrive, or, at least, those which I wish to arrive at from what we have put before you, are just these: If there is truth and reason in the statement which I have made to you, and if it should appear to you that there are objections to the Metropolitan Board of Works being made the public authority over these undertakings, even though it should be needed at any future occasion that some authority might be advisable for taking over these Water Companies, then I think the Companies might urge upon you that which I, on their behalf, do urge upon you strongly—that the Government should not allow the second reading of this Bill to pass; and for this simple reason, that if you allow the second reading of this Bill to pass, and you allow it to get into Committee, you put the whole of these Companies to an enormous expense in a very intricate litigation. I think there is very little doubt the inquiry would result in their coming out satisfactorily in the end, as far as preventing the Bill from proceeding further; but you would have made what appears to me to be this unsatisfactory admission—at any rate, it would be so treated by the Metropolitan Board of Works—that by the House according to them a second reading of the Bill, even though it was proved to the perfect satisfaction of the Committee afterwards that they were not a suitable authority to take over the water-works, they would, on coming before you again the following session, refer to that decision of the House as a proof that they were a proper authority, and by amending their proposition to some extent or other, would quote you as having got rid of what I think myself is one of the fundamental objections to their being allowed to take these works. I beg to say Mr. Baxter will address you much more in detail upon the matters belonging to the Companies, which I have purposely avoided.

Mr. BAXTER: The principal object in waiting on you to-day, sir, is to ask you whether this Bill—the Purchase Bill, not the Bill for the construction of new works—ought to be read a second time; and, if you think not, whether you will aid the Companies, who intend to move the House that it be not read a second time. There are eight Water Companies in London, and their districts extend over an area which I should like you to see, if you do not mind the trouble of looking over a map. [Here a map was handed to the President.] This area is just twice as large as the whole Metropolitan area within the limits of the Companies, as defined by their parliamentary Acts. This [pointing to the map] is the area of the Metropolis which is under the jurisdiction of the Metropolitan Board of Works. The limits which the Companies occupy south of the Thames are an enormous area beyond what is comprised in the Metropolis; while in the north, which is another part that the Metropolitan Board propose to take, is an area of country measuring in square miles more than twice the area of the Metropolis over which they have proper dominion, according to their constitution. It seems to us that this is a very great objection to such a measure as this, and that they should become purveyors of water outside the Metropolis, with which they have no connection, for miles and miles, and to an area outside just as large as within the Metropolis, in which they will be simply acting in the character of Water Companies, seems in itself a most anomalous state of things to be proposed. Now, the capital of these Companies, as contributed from time to time, is £12,000,000 sterling. The first Company were founded in 1620, so that they have been about 250 years in existence, and the capital of all the Companies laid out in hard cash is more than £12,000,000 of money. That now is of a value of 25 to 30 millions; and, if they are to be bought up, there must be authority given to the Metropolitan Board of Works to borrow to this extent, and which will be in addition to the debt they already owe. We see in the Paris Municipality the appearance of a second nation borrowing, and creating a second National Debt. They have there between £100,000,000 and £200,000,000 borrowed. We shall be having, in the Metropolitan Board loans, a new National Debt, which, growing in dimensions from year to year, will soon become a rival to our ancient venerable National Debt, which we have so long maintained, and never made an effort to pay off. This seems to us another great objection to the measure which the Board propose. Then I turn to the hardship upon the Companies. They began 250 years ago to supply London with water. This has been extended at different periods, and by different Companies, and they have gone on in that effort continuously. Some of them were for 20 years without a dividend, and all of them for a long period of years were either without a dividend, or with a most inadequate dividend; and now, after those years of existence, when they are put together, they are dividing amongst them only 7 per cent. on their capital. That is all they can divide. Now, it is extremely hard that Companies who have laboured all this time, and who have laid out their capital with an assurance from Parliament that they might raise their dividend to 10 per cent., and should not be asked to reduce their rates upon water until they had got their 10 per cent., should now be stopped in the middle of this process—when they arrive at 7 per cent.—and be told that the Metropolitan Board of Works are to buy them up. You recollect when the question of buying up the railways was before the Houses of Parliament. There the terms agreed upon by the nation were that they were not to be interfered with until their dividends had reached 10 per cent., and then they were to be bought up on certain specified terms. The enormous amount of railway stock renders it impossible to look forward with any expectation that they ever will be bought up; but those were the terms upon which they were to be interfered with, if at all. But, then, Parliament, in dealing with private enterprise, has always done this—it has given a limited area and limited capital, fixed distinct rates of charges that Companies should make, and said, “You shall divide up to a certain amount, and then reduce the charge for the article you supply; and when you get up to that you shall stand by it.” Parliament has steadily refused to interfere with that arrangement. There have been Bills brought into Parliament many times for purchasing; but, with the exception of one or two, or three, there has been no Bill allowed to pass Parliament that did not state in its very texture the terms that were to be given to the Companies. Now, sir, here they say to the Water Companies, “You shall be bought up, and you shall have such a sum as an arbitrator



appointed under the Lands Clauses Act shall award you." An arbitrator? To deal with Companies of this magnitude? Money to this amount? Why, surely, if you or I were selling an estate, would we consent to sell it by arbitration? Is it a thing that can be presented to an Englishman who is in possession of his property, that he should sell it by arbitration? Does not he put his price upon it, and the other party says to what price he will go, and, if they cannot make terms, the bargain is off? Why, no man in his senses would sell by arbitration. But that is the simple mode which the Metropolitan Board of Works have prescribed in this Bill—that the Companies shall sell by arbitration. If you get an eccentric arbitrator—and such men do exist; if you have an incompetent arbitrator—and such men do exist—what becomes of the property? There is no appeal, and no higher tribunal to go to. The whole property is confiscated. The case proposed in this Bill is to sell in a manner which is not according to the usages of society, nor according to the dictates of common sense. Now, on two former occasions, when Bills were brought into Parliament—once by the Government, and once by the Corporation—to purchase the Companies, we opposed on the second reading, and they were obliged to, and did, strike out all the powers to purchase.

**THE PRESIDENT:** In what year was the City attempt made?

**MR. BAXTER:** I forget, but I will furnish you with the date. On two occasions we have opposed the second readings, and it has resulted in a rejection. When the telegraphs were bought up by the Government, I communicated with the Agent of the Government on the matter, and he told me that he was going to bring in a Bill, under the authority of the Government, to buy up all the telegraphs. I asked, "What is the price you propose to give?" He said, "That is to be settled by arbitration." "Then," I said, "allow me to inform you that that is not the habit of Parliament, and, if you expect to get your Bill, you must make your terms before going to Parliament." He rather tossed his head, and, from his appearance, thought I was dictating to a Member of the Government, and in a manner that was not quite reasonable. Immediately he took counsel, and, when he saw me again, he conceded that he must name the terms; and I made the terms of purchase for all the telegraphs before the Bill was even brought into Parliament to purchase them. He submitted to the practice of Parliament, and the consequence was that the Government did buy them, and the terms of purchase were not unsatisfactory to either party. Then, sir, the Committee on the Fire Brigade, when they went to deal with this question, took up the point of whether it was not advisable that these Companies should be sold to one central authority, and they named the Metropolitan Board of Works. A division was taken in the Committee upon it, and the division was ten to three against recognizing the Metropolitan Board of Works as the authority that ought to be allowed to buy. Now, sir, the Companies object to sell, on the ground—first, that they have a million and a half of capital so recently laid out that it has not come into produce yet, and, therefore, any purchase of these Companies under such a state of things would be a confiscation. But they take higher ground still. They say, "We were not formed to be bought up. When Parliament made an agreement with us, embodied in our Acts of Parliament, we were bound to take certain rates, and come under certain restrictions, and certain Government control; and were obliged to make certain reductions, after attaining the 10 per cent. profit; but nothing was said about purchase—nothing inserted about purchase—therefore, we are not Companies made to be purchased." In the case of the Railways, special Acts of Parliament were passed, in order to enable the Government to purchase them, so it might be in the case of the Water Companies; but that has not been done, and we contend that, unless such Acts of Parliament are passed, in which the terms are fixed on which they may be bought, as in the telegraph statute, and under the statute for the purchase of the railways, there ought to be no purchase of the Water Companies, and that a Bill for that purpose ought not to be sanctioned. Then, sir, we are bold enough to say that the present management of these undertakings is more efficient, and just as economical as, if not more economical than, the management of them would be by the Metropolitan Board of Works. They cannot manage the undertaking, without a staff of officers just as large as the Companies have at present. Companies who divide every farthing of profit that they can get will not keep a supernumerary staff. Are they likely to keep officers unoccupied, and as mere ornaments? Every man whom they employ for a wage or at a salary is one who does work worth that wage or salary; and you may depend upon it, if it were not so, there would, at the next board day, be a motion made to dismiss, or reduce the salary of the officer. There is the strongest motive, in the present arrangement, for economy, and is it likely that the same motive for economy would exist if the works were bought by the Metropolitan Board of Works? Is it likely that the same strict, stringent economy would be exercised, in the staff and work that would be required, as is now exercised? Would it be exercised so well by the staff of the Metropolitan Board as by private individuals, who put into their pockets every farthing they save by economy? Then, again, there is another thing. I have said that the Companies were under bond by their parliamentary Acts to reduce the rate of charge for water so soon as they got their 10 per cent. The Metropolitan Board of Works carefully strike that out of their Bill. They are under no limit whatever, and no restrictions. They may take 20 per cent. We cannot take more than 10 per cent. If we were able to do so the terms of the customer would be reduced immediately. The Board of Works will not be limited. They take the full toll that they can get, without the limit of 10 per cent. Therefore we say that the present constitution of the Water Companies is more beneficial than it would be if the water supply was in the hands of the Metropolitan Board of Works. And whatever the Metropolitan Board may do is compulsory throughout the extended district. The Companies now—

**THE PRESIDENT:** I did not know whether you referred to their own area, or to an increased area, when you said, "to the extended district."

**MR. BAXTER:** The Water Companies take their rates throughout the extended district. When the Metropolitan Board get into possession they will take the same rates, and they are not bound to reduce them. That is the strong point I make. Then there is a certain control over private Companies. Private Companies are, in reason, amenable to Government supervision. You, sir, in this Local Government Board, exercise a control over these Companies. You appoint their Water Examiner, and you have the report of the Water Examiner presented to you. Again, it is open to a certain number of consumers to go to the Board of Trade and demand a special inquiry into any manner of complaint they have.

**THE PRESIDENT:** To this Board, you mean?

**MR. BAXTER:** Yes; I think they come here now. You then appoint a Special Commission to examine into the cause of complaint, and so they are amenable to Government control; but, if you had to manage in this office the Metropolitan Board of Works, what an unmanageable animal it might turn out to be. Then, sir, the question is, is there any public grounds for complaining of the Water Companies? We see things stated in the newspapers, and, if a man were to be guided by the newspapers, I do not know where he would be. We see these things often stated about the analysis of water; but, sir, you yourself, through this office, control the purity of the water; and, if it were not pure, the fact would be laid before you, and you would immediately order an inquiry into the facts. Your

Examiner asserts that the water is pure and wholesome, and he is a great authority in the matter. The Royal Commission on Water Supply, presided over by the Duke of Richmond, sat for months and months; that Commission inquired into the wholesomeness of the water, and they say in their report that they have no reason to suppose that the quality of the water supplied to London is anything but perfectly healthy and pure. They make no complaint, but they endorse the wholesomeness of the supply. Take, again, Mr. Ayrton's report—the quality of the water there was not impugned. And, again, there is another authority—Dr. Tidy's report, which is supplemental, but scarcely official, and that report goes to the same effect, that the water is pure. From every authority the purity of the water is continually established. If the water is pure, where is the complaint against the Companies to be made? There is water enough. I think we are furnishing—I do not think I am speaking without bounds when I say something like 40 gallons per day per head of the population of London. Only to-day I received a telegram from Sheffield to say that at Sheffield they had reduced the water supply, and still found it abundant at the rate of 17 gallons per head. Nobody can complain of the quantity or the quality of the water we supply. Then where is the complaint? Where is the cry? What is there to induce Parliament to authorize the confiscation of those Companies, or the superseding of them? Are they inefficient? There is the answer. Are they extravagant in their demands? They observe the conditions of their Acts of Parliament, and, if they did not, a complaint would soon be made of them. Where, then, is the complaint? The last point is this: Are the Metropolitan Board of Works, if the Companies are to be purchased at all, the authority who should purchase them? They are a transitory body, not a permanent Corporation properly. Every session we are discussing, and every month we see schemes for the establishment of a central authority in the Metropolis, which would supersede the Metropolitan Board of Works. Why are they to be clothed with the powers to purchase all these Companies, and to raise all these moneys? What are their qualifications? I said before that the Committee on the Fire Brigade negatived the idea of their being the proper authority to do it. And, sir, you will have seen, in your observations of public events, that the proposition on their part to do it has excited the alarm of their own constituents. The Vestries are in rebellion. The Vestry of St. Pancras led the way, and the other Vestries seem to follow. They had a meeting of the Vestries the other day, when three-fourths of the Metropolis were represented, and they condemned with one voice the Bill for the supplementary supply by the Board, and by 24 to 7 they condemned the Bill for the purchase of the Companies. Here are their constituents repudiating the measure they propose, disliking it, and remonstrating against it; and how are they to be recognized as the proper body to purchase the Companies if such a thing were necessary. But, sir, we fall back on our original position. They are bringing in a Bill to compete with the Companies. I know they say, "We do not compete with the Companies," and they say it because they propose by their Bill to supersede us in the supply of water, but that we shall be left to levy all the rates that we do at present levy for the supply of potable water. I do not suppose that, if you pay me for the supply of potable water, which you are supplied with from another source, that you would long continue to pay me for that which I do not supply. But they propose to supply potable water, and they say they do not interfere with our rates. But the next step would be that our rates would be reduced, as people would not pay for the potable water which we did not supply, and so we should be competed with, and our income reduced. There was, therefore, really a competition in the proposals of this Bill. As the honourable member has said, if the second Bill is passed we shall have to have our streets ripped up from end to end, and we shall have two sets of pipes where only one is necessary, and we shall have, therefore, twice the number of repairs, and, consequently, twice the difficulty of passing along the streets. At present we scarcely pass half-a-dozen streets without seeing the roadway being taken up for repairs, and we shall have that mischief doubled and permanently settled upon us in the Metropolis if we are to have these two sets of pipes laid in the streets. But in that meeting of the Vestries to which I have referred, they condemned the Works Bill, and urged that it ought not to go on. But why do the Metropolitan Board promote it? They want to depreciate the value of our property, and to have the opportunity of buying it at a much cheaper rate. That is just the reason why they do it, and that is the only reason why they do it. It is an absurd proposition that 16 million gallons of water can be any adequate supply for the Metropolis. The mode in which they take it is equally absurd. They propose to pump it out of the earth as the purest water ever got. Let them go to various parts of London where they have sunk wells, and see the analyses of the water, and you will find there some of the worst water, and it will be found that these wells generally are very impure sources of supply. But we say, in conclusion, that we have committed no crime, we have not broken the terms of our Acts of Parliament, we have justly fulfilled our duty, we are efficiently supplying the public, and we are entitled to the protection which Parliament gave us. We say that a Bill so crude as this, by forcing us to sell the property on which we have invested £12,000,000, and which, as I have said, has now reached a value of from £25,000,000 to £30,000,000, ought not to be sanctioned, and we humbly beseech you, and those to whom the duty belongs in Parliament of dealing with this Bill, to oppose its second reading, and say it shall not receive the sanction of the House, because, in principle, it is fatal to private enterprise, and ought not to be sanctioned by Parliament.

**THE PRESIDENT,** in reply, said: I take it that the real object that you have in coming here is to lay before me your views, and to ask me, on the part of the Government, to say that we will oppose the second reading of the Metropolis Water-Works (Purchase) Bill when it comes on, about three weeks hence. Now, you can hardly expect me to give an answer to that question. But what I can promise is that the representations which you have made, with great clearness, force, and ability, shall be submitted by me to the Government, and I will take counsel with the Government as to what course shall be pursued. There can be no doubt of the importance of the subject, and, that, without going into the arguments which have been put forward by Mr. Baxter, as to whether it is not perfectly competent to Parliament to insist upon the unification of the Water Companies, and of their management by a Municipal Authority. The points you have urged in detail are, of course, very much to the purpose, and very cogent matter from your point of view, and as against the proposals of the Metropolitan Board of Works. Now, I am not altogether unacquainted with the subject, because I was a member of the Ayrton Committee, which led to the passing of the second Metropolis Water Act to which you have alluded, and I am very well acquainted with the substance of the Duke of Richmond's commission. Now, I agree at once that this is a question *per se*, and that you cannot argue from what Parliament has sanctioned and thought proper in the case of any of the great towns of England, and apply that to the case of the Metropolis, which is essentially different, by reason of its enormous magnitude. Even Glasgow, Liverpool, Birmingham, and Manchester, are very inferior in point of population, and the circumstances, too, of the Metropolis are so different that you cannot argue from the one to the other; and, therefore, I take it that the propositions to be advanced in favour of the plan which



is before the world, before Parliament, and the public, must stand or fall upon its own merits. You have brought into effective light some of the great difficulties of the position, and some of the considerations which must weigh with any one when one is going to make up one's mind entirely upon it. You rightly observed that the second reading of the Bill is a point of great importance; and, whatever the view of the Government may be, and whatever the view I might finally take upon the matter in my own mind, you must be aware that Parliament has it in its power to pass or not to pass the second reading; and it is quite essential, I think, that the subject should be thrashed out by Parliament on the second reading, and that that very important stage of this particular measure should not be taken without full knowledge of all that is to be said on the other side. The details are matters of comparatively minor importance, and Parliament, undoubtedly, in passing the second reading of the Bill, will affirm two very important propositions:—First of all, that it is urgently necessary for the public interest that this consolidation of the Water Companies should take place; and, secondly, that the purchase should be effected by the Metropolitan Board of Works. It cannot be too plainly stated that Parliament must bear the responsibility of dealing with these two propositions, and that they will be best dealt with in the second reading of the Bill. I have mentioned this view of matters to show that the subject is one which not only interests me, but one which I have had occasion to study. I may say, in corroboration of what has been stated here to-day, that I have found, certainly on two very important occasions, that the pressure which the law permits to be exercised by these departments over the Water Companies is not a mere futile pressure. But on two occasions, when objections have been taken by Colonel Bolton—whose work is of very great importance on this subject, and whose merits are to be recognized—when objections have been taken by him to the imperfect condition of the water in respect of two of the great Companies, I have found a readiness on their part to acquiesce in the criticisms that were made, and very large investments of capital have been certainly the consequence of these remonstrances. I am bound in fairness to say that, because it may be urged, from one observation which fell from Mr. Samuda, that the powers of control vested in the Government by the Water Acts have been unexercised, and, therefore, that there had been no occasion for them to be exercised. That can hardly be said to be the case, because we have power, and have exercised that power on two very important occasions. I will not ask you to hear me any longer, because this is not the place in which I have to state finally what may be the view of the Government or myself on the subject. I can only say that the points which have been laid before me to-day shall be carefully stated to the Government.

#### WEST HAM GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held on the 22nd ult., when the following report of the Directors and statements of account were submitted and adopted:—

In presenting the report, together with the audited statement of accounts for the half year ending Dec. 31, 1877, your Directors have to express their congratulations at the continued prosperity of the Company.

On reference to the accounts submitted, it will be seen that there has been a large increase in the rental, although a reduction in price took place at the commencement of the year.

At the last meeting of the Shareholders your Directors drew attention to the growing neighbourhood and the demand for gas, which would necessitate great additions to the buildings and plant at the works, as well as extension of mains in the district.

Contracts for another gasholder and tank of greater capacity have been entered into.

Further capital being required, an extraordinary meeting will be held, pursuant to notice, for the purpose of authorizing your Directors to raise the same.

The amount available for division is £7561 15s. 2d.; out of this sum your Directors have set aside £100 towards the leasehold redemption-fund; from the balance they recommend the declaration of a dividend at the rate of 10 per cent. per annum, free of income-tax, on the paid-up capital of the Company for the half year ending the 31st of December last.

The Directors retiring by rotation are Mr. John Meeson and Mr. Joseph Scott, who, being eligible, offer themselves for re-election.

Your Directors regret to announce the death of Mr. Thomas G. Tonge, one of the Auditors of the Company. Mr. John Brooks, a duly qualified Shareholder, has given notice of his intention to become a candidate for the office, and has been proposed for the same.

#### DR.—Profit and Loss Account, for the Half Year ending Dec. 31, 1877.

To Coals	£9,713 6 3
Wages	2,958 12 7
Purifying materials	138 9 1
Repair and maintenance of works, mains, meters, service-pipes, &c.	1,707 11 0
Lighting, extinguishing, cleaning, and repairing lamps	354 8 0
Salaries, Directors and Auditors fees, and Collector's commission	1,196 7 9
Insurance	16 3 4
Rent, rates, and taxes	896 17 10
Printing, stationery, advertising, and other general charges	199 8 2
Bad and doubtful debts	18 3 11
Meters—amount written off	104 14 6
Mains—ditto	350 0 0
Balance	8,001 15 11
	<b>£24,755 18 4</b>

#### CR.—Profit and Loss Account.

By Rental	£19,393 18 7
Coke, breeze, tar, and other products	5,341 7 0
Interest on deposit	20 12 9
	<b>£24,755 18 4</b>

#### DR.—Balance-Sheet.

To Capital—26,000 shares, £5 per share paid	£130,000 0 0
Reserve-fund	11,993 5 11
Leasehold redemption-fund	803 0 11
Amount due to sundry persons	13,100 13 5
Dividends unclaimed	24 6 2
Balance on June 30, 1877	£6,050 19 3
Profit and loss—balance on Dec. 31, 1877	8,001 15 11
	<b>£14,061 15 2</b>
Less dividend to June 30, 1877	6,500 0 0
	<b>£7,561 15 2</b>
	<b>£163,393 10 7</b>

#### CR.—Balance Sheet.

By Works, plant, &c.	£129,582 9 4
Reserve-fund invested	11,710 17 1
Leasehold-fund ditto	776 2 0
Stock of coals	3,410 12 9
Ditto coke, breeze, tar, liquor, &c.	751 2 10
Amount due from sundry persons for gas, coke, breeze, tar, liquor, &c.	14,771 10 4
Cash at bankers	2,339 16 3
	<b>£163,393 10 7</b>

At the close of the ordinary business, the meeting was made special, and a resolution was adopted authorizing the Directors to borrow the sum of £10,000 by any of the methods authorized by the Company's Acts of Parliament, or to create and issue not exceeding 10,000 new shares.

#### BARNET DISTRICT GAS AND WATER COMPANY.

The Ordinary Half-Yearly General Meeting was held at the Guildhall Hotel, London, on Friday, the 22nd ult.—J. F. BONTOMS, Esq., in the chair.

The SECRETARY (Mr. Alfred Lass) read the notice convening the meeting, the seal was affixed to the Register of Shareholders, and the following report presented:—

The Directors beg to submit to the Proprietors the accounts of the Company for the half year ending the 31st of December last, which show the financial position of the Company.

The balance of profit and loss net revenue account amounts to £2347 11s. 5d., out of which the Directors recommend the declaration of a dividend for the half year ending the 31st of December last, at the rate of £4 15s. per cent. per annum on the A stock and shares, and £3 15s. per cent. per annum on the B stock.

The gas-rental during the half year has amounted to £4187 3s. 9d., which shows an increase of £358 11s. 1d. on the corresponding period of last year. The water-rental has amounted to £2127 9s. 9d., which shows, on the same period, an increase of £301.

During the past half year, the Directors have taken over that portion of this Company's district in the parish of Friern Barnet, which was formerly supplied by the New River Company.

As the new well yields so large a supply of water, the Directors have considered it advisable still further to extend the mains; and it is their intention to continue to carry out such extensions in connection with both the gas and water undertakings, as will ensure that success which they, in common with the other Proprietors, so much desire.

The erection of the new gasholder has again been postponed.

The retiring Directors are R. M. Massey, Esq., S. Pontifex, Esq., and R. Wilkinson, Esq., who, being eligible, offer themselves for re-election.

The retiring Auditor is E. Beekwith, Esq., who, being eligible, offers himself for re-election.

The dividend, if sanctioned, will be payable on the 18th of March next.

#### DR.—Gas Revenue Account, for the Half Year ending Dec. 31, 1877.

To Manufacture of gas—	
Coals	£1536 7 3
Purifying	49 2 11
Wages	253 18 0
Repair and maintenance, works and plant	238 15 10
Salaries of Engineer, &c.	83 6 8
Distribution of gas—	
Salaries—Inspectors and Clerks	131 13 0
Repair and maintenance, mains and services	271 10 8
Repairing and renewing meters	42 4 6
Public lamps—	
Lighting and repairing	80 10 4
Rent, rates, and taxes—	
Rent	2 14 4
Rates and taxes	73 9 10
Management—	
Directors' allowances	100 0 0
Salaries—Secretary and Accountant	66 13 4
Collector's commission	60 10 7
Stationery and printing	39 6 0
General establishment charges	71 11 5
Auditors fees	5 5 0
Law charges	16 3 2
Bad debts and allowances	22 16 2
Balance to profit and loss account, net revenue	1979 4 3
	<b>£5130 4 4</b>

#### CR.—Gas Revenue Account.

By sale of gas—	
Private rental	£3697 13 9
Public lighting	289 5 0
Rental of meters	100 3 11
Residual products—	
Coke	690 10 10
Breeze	26 7 4
Tar	100 15 9
Liquor	1 2 9
Rent account	24 0 0
	<b>£5130 4 4</b>

#### DR.—Water Revenue Account.

To Coals	£470 11 8
Wages	186 6 10
Repair and maintenance, works and plant	119 13 7
Salaries—Inspectors and Clerks	28 5 0
Repair and maintenance, mains and services	58 2 1
Salaries of Engineers, &c.	41 13 4
Rent	20 19 8
Rates and taxes	39 4 10
Directors' allowances	50 0 0
Salaries—Secretary, Accountant, &c.	33 6 8
Collector's commission	30 5 4
Stationery and printing	19 13 4
General establishment charges	33 15 8
Auditors fees	2 12 6
Law	0 18 9
Bad debts and allowances	16 13 6
Balance to profit and loss account, net revenue	1021 2 0
	<b>£2175 4 9</b>

#### CR.—Water Revenue Account.

By Sale of water	£2127 9 9
Rents	47 15 0
	<b>£2175 4 9</b>

#### DR.—Profit and Loss Account, Net Revenue.

To Interest on loans and mortgage bonds to Dec. 31, 1877	£582 19 3
Ditto on temporary loans and moneys received in anticipation of calls	210 17 1
Balance available for dividend for the half year ending Dec. 31, 1877	2347 11 5
	<b>£3141 7 9</b>

#### CR.—Profit and Loss, Net Revenue.

July 1, 1877—	
By Balance brought from last account	£1909 19 0
Less dividend paid for the half year ending June 30, 1877	1900 11 7
	<b>£9 7 5</b>
Dec. 31, 1877—	
Revenue account, gas	1979 4 3
Ditto, water	1021 2 0
Fitting account	131 14 1
	<b>£3111 7 9</b>

The CHAIRMAN said, in moving the adoption of the report and balance-sheet, he should not have to take up much of the time of the Shareholders, which, no doubt, was an acceptable announcement to them. He had carefully read over the figures of the accounts, and, no doubt, every other person present had done, and he believed they all agreed with him that, upon the whole the state of affairs therein disclosed was very satisfactory. There had been no increase in the expenditure during the half year, except such as was justified and rendered necessary by the progress of the Company. The only item of this kind, of considerable amount, was for the gas and



maintenance of works both for gas and water. That item would, of course, increase as the Company's rental increased, and the business made further progress. The fact of the increase of the rental during the last half year must be very encouraging to every one. In the gas department the rental had increased £358, and in the water department £301, making a total of £659. Turning back to the previous half year, he found there was then an increase of nearly a corresponding amount, so that if the Company continued to progress in this manner, the revenue would soon be in a very flourishing condition. The new well he should not say much about on the present occasion, because he had spoken of it at former meetings; he would only remark that it had been successful beyond the expectations of the Directors, large as those expectations were. The expenses connected with it had necessarily been large, not only in connection with the supply itself, but also in reference to the distribution of the water through the district. When he mentioned the fact that something like 10 miles of pipes of considerable diameter had been laid down during the half year for the distribution of water, the expense that had been incurred would be readily understood. The total expenditure, including the sum laid out upon the works, was £9500, and that outlay would soon be largely productive of benefit to the Company. The Directors had now to look forward to the next great step to be taken in connection with the gas-works—i.e., the erection of a new gasholder. It was very desirable they should have it soon, and no doubt it was a matter to which their early attention must be directed. He was happy to state that, in consequence of the care with which the business of the Company was conducted, the number of complaints in the district had been considerably reduced, and the Board had reason to believe that most of these did not arise from any deficiency in the supply either of gas or water, but from defects in the appliances of the consumers, or want of attention on their part. As to the water, the Board had scarcely any complaints of a short supply, except on Mondays. They desired, as much as possible, to avoid working on Sunday, and if their customers would not provide themselves with cisterns that held more than a single day's supply, it was not surprising that they found their store run short on Monday morning. It was only in cases of insufficient cisterns that these complaints now took place. He thought the Directors might fairly urge upon their customers that, as the Company had been at very great expense in providing a plentiful supply of water, they ought to provide for themselves ample means of storage. The same remarks applied to the gas. The Directors found that when complaints were investigated, they arose from the fact that the pipes for distributing the gas in the consumers' houses were inadequate, so that instead of making complaints to the Company, they should have adopted the remedy which was in their own hands. In many cases the Directors had provided new burners, and given them away to satisfy consumers whose old burners were found to be completely stopped up, and who had complained that they could not get an adequate supply. As to the question of price, there were still a few complaints, although he was happy to say that a more reasonable feeling existed in the district, and complaints were not so loud as they had been. The great bulk of their customers appeared ready to wait the proper time, when they might fairly expect a reduction. He referred to those parts of the district in which a comparatively high price ruled—not high, however, when the sparseness of the population and the length of main required to supply a few houses were taken into consideration. The Directors repeated what they had said from the first, that as soon as they could get a reasonable dividend for their Shareholders, they would reduce the price where it had been necessarily high. He thought this was as fair as could be expected, and he believed that a feeling of this kind prevailed in the district. With regard to the public bodies, he was glad to say the Company were working more harmoniously with them than they had done in past times; they had become more reasonable, perhaps because they found that they themselves had difficulties to contend with, as well as the Company, in the discharge of their duties, and this made them a little more ready to sympathize and refrain from grumbling. So much for the past and the present. Looking out upon the future, he thought the prospects of the Company were hopeful. They had articles to supply of undoubted quality. There was an attempt made a little while ago to prove that the Company's water was not good; but this was now at an end, for they had proof indisputable that it was the best water that could be obtained; while, as to the gas, it was now admitted that the Barnet gas was better than that supplied in London. Such being the case, the Barnet people ought to be satisfied. The works of the Company could not be better placed on each side of the railway; and though, perhaps, they would like to have had the water a little higher, they had the compensating advantage that they got fuel very cheap. The district of the Company was a very large one, the population was rapidly increasing, and they were continually getting new customers. During the last six months they took 218 new customers into supply, who were formerly supplied by the New River Company, although in this Company's district. As time passed on, they would get an advantage as to their loans. They were now down to 5 per cent., whereas formerly they were at 6 per cent., and no doubt when the present loans required to be renewed they would get even better terms. Then they had all that could be desired in regard to their staff of officers. They could not wish for a better Secretary, Engineer, or Collector. With respect to the Directors, it was not for him to say anything about them beyond this, that they were very attentive to the Shareholders' interests, always assembled a full Board, and the Works Committee gave a large amount of valuable time to the discharge of their duties. He might certainly claim for the Directors that they had shown no covetousness about their fees. They had done their best to promote the interests of the Company in the past, and they were encouraged by the success with which their labours had been crowned to continue those efforts in the future.

The DEPUTY-CHAIRMAN (Mr. Glaisher) seconded the motion. He said he did so with more than usual pleasure on this occasion, on account of the fact mentioned in the third paragraph of the report, that the revenue of the Company was increasing. That increase was gradual and rather slow, but it was continual; and, such being the case, he was hopeful that it would lead to the results indicated by the Chairman. In every way that he looked at it, the prospect was encouraging. Until recently they required to burn coal all night; now that necessity was avoided, owing, in a great measure, to the larger pipes laid in the district. Not only in this matter, however, but in everything else, he seemed to see progress, and believing, as he did, that this progress would continue, he had great pleasure in seconding the motion for the adoption of the report.

Mr. LONDON said the Board appeared to have expended a large sum of money during the half year in laying down new mains and services for water, but he did not see what advantage arose from it, as the increase in the rental was only £300. He thought £4341 was a large sum under the head of "Rental and arrears," in addition to £1309 under the head of "Amount owing by sundry persons."

The CHAIRMAN said the £4341 was for arrears in both departments—water and gas; the £1309 was for sales of tar, breeze, &c., at the end of the year. As to the outlay for mains, &c., the Company had not derived all the advantage of it, as the work was only completed in the last half year. The Company were bound to make the outlay if they would comply

with the terms of their Act, and give satisfaction to the district. Every yard of pipe laid down was the subject of careful consideration on the part of the Board, who incurred no unnecessary expenditure.

Mr. SPORNE thought it must be patent to every one that it was good policy on the part of the Directors to lay down large pipes, because thereby less engine power was required for conveying the water, and greater satisfaction was given to the consumers. In the case of gas, small pipes meant high pressure and increased leakage. The Chairman had alluded to the increase in the items of repair and maintenance of works and plant, and repair and maintenance of mains and services; but he should like to have some further explanations on the point.

The ENGINEER (Mr. Martin) said the increase in the last item arose from the fact that the Company had been taking up some small, and putting down larger mains. The same might be said of the repairs of works and plant; these were items not really chargeable to capital account.

The SECRETARY said that the repairs of works were a little over 3d. per 1000 feet of gas, which was small as compared with the London establishments. It was necessary to keep the works in a thoroughly efficient state.

Mr. SPORNE said he was glad to see in each department economy had been studied, and, if that course was continued, the Shareholders might hope to see their desires realized. He wished to know whether the Directors had arrived at any conclusion with respect to the erection of a new gasholder. He hoped there was a possibility of staving off the necessity of incurring the expense for another year or so.

The CHAIRMAN said his own impression was that the Directors would have to give the subject their attention in the coming summer. The question of providing the funds would be well considered before coming to any determination; also the site on which the holder should be erected. He hoped they would soon be in a position to tell the Shareholders that they were in possession of ground for the purpose. It must be borne in mind that the Company had only one holder, which was a serious matter in case of accident.

Mr. HORSLEY said the Directors would be blamed if, from any accident, the district was left in darkness, and that might happen while they had only one holder. There was a gentleman of great experience in gas matters present—Mr. Harris—and he would ask his opinion on the subject of the policy which should be pursued.

Mr. HARRIS said he should think it was decidedly good policy to put up another holder as soon as the funds could be obtained. It was decidedly dangerous to supply a large district with only one holder. His own impression was that when the present holder was put up there were two others on the works. If they had been removed, the sooner the Directors proceeded to the erection of a new one the better.

The motion was then put and carried.

The CHAIRMAN moved, and Mr. MASSEY seconded, a motion declaring the dividends recommended in the report, which was adopted.

Mr. HORSLEY, referring to the remarks made upon the cost of laying new water-mains, said the result had been very satisfactory. At one time the Company had 4 and 6 inch mains, and it then took 24 hours to fill the district; with their enlarged mains they could do it in 13 hours. In fact, but for this increased capacity, they could never have taken over that part of the district in Friern Barnet formerly supplied by the New River Company. It had effected a great saving, both in fuel and time. The pressure formerly was 110 lbs. on the square inch for driving water, which ought almost to have gone by gravitation alone. Now the pressure was only about 45 lbs.

The retiring Directors were re-appointed, and Mr. MASSEY and Mr. WILKINSON returned thanks.

On the motion of Mr. LARKING, seconded by Mr. KNIGHT, the retiring Auditor, Mr. Beckwith, was re-elected. The remuneration of the Directors was fixed at £300, as last year.

The CHAIRMAN said he thought the meeting ought now to pass the usual resolution in recognition of the services of the staff. He had much pleasure in moving that the thanks of the Shareholders be given to the Secretary, Engineer, Collector, and the other officers of the Company.

The DEPUTY-CHAIRMAN seconded the motion, which was supported by Mr. Sporne, and cordially adopted.

The SECRETARY said he was exceedingly obliged for the vote just passed, and for the kind manner in which it had been submitted to the meeting. He would only say that, whatever information Shareholders desired in reference to the affairs of the Company, he was at all times happy to furnish, and he took the opportunity of saying that he thought it would be better, if inquiries on matters of detail were to be made, that Shareholders should see him at the office of the Company, where the books could be referred to, instead of leaving them to be made at these meetings.

The ENGINEER also acknowledged the compliment paid to him. He could promise that, so long as he was connected with the Company, nothing in his department should be left undone to ensure the satisfactory working of the concern. He came to the meeting that day with great pleasure, because of the work which had been done in the half year to which the report and accounts referred. The laying of the new main had taken much anxiety from his mind, for now they could work with a third less pressure, and could supply two-thirds of the district by gravitation which before had to be supplied by pumping. They were thus not only made safe in every way, but they had been enabled so to connect their reservoirs that they could send water nearly to Finchley—an immense advantage in case of fire. The extensions now made gave them greater command over the waste, and was advantageous in every way.

Mr. LONDON asked whether, if the Bill of the Metropolitan Board of Works should pass, it would at all affect the wells of the Company.

The CHAIRMAN said it was impossible to say whether the Bill would pass, or, if it did, what interests it would affect. If it affected the interests of the Company, they must look to their Solicitor, Mr. Bannister, to protect them from injury.

Mr. SPORNE asked the probable cost of the new gasholder.

The DEPUTY-CHAIRMAN said at present prices it would probably come to £5000 or £6000.

Mr. HARRIS thought the existing holder cost about £4000.

Mr. SPORNE again expressed a hope that, looking at the circumstance of the Company being already overweighed with capital, the necessity for erecting the new holder might be postponed.

The DEPUTY-CHAIRMAN said the Directors more than any one else were impressed with the need for economizing capital; but the new gasholder was a necessity. Their present storage was not equal to a day's consumption in winter, and, therefore, if they could see their way now iron was cheap, it would be very desirable to erect the new holders this year. The Shareholders must place confidence in the Directors to do what was best for the Company.

A vote of thanks was given to the Directors for their services, and the Chairman having acknowledged the same, the proceedings terminated.

APPOINTMENT OF A NEW GAS EXAMINER IN LONDON.—Mr. W. J. Dibdin has been appointed Gas Examiner, under the provisions of The Gaslight and Coke Company's Act, 1876, at the testing-place at Ladbroke Grove, at a salary of £400 per annum.



## READING GAS COMPANY.

The Half-Yearly Meeting was held on the 25th ult., at which the following report of the Directors was submitted:—

The accounts herewith submitted are in the form prescribed by the Board of Trade, under the recent Gas-Works Clauses Act, and this form being a variation from that in which the accounts have been previously presented, prevents an exact comparison with the accounts of the corresponding half of last year, although the general results can be compared, and will be found satisfactory. The Directors have, therefore the pleasure to recommend that full dividends be paid, on the 1st of March next, on all the stocks and shares of the Company.

Your Directors have now settled for the liabilities incurred on account of capital, which leaves capital account indebted in the sum of £946 0s. 5d., which your Directors propose to raise by obtaining the further sum of £1000 by mortgage, a resolution to effect which will be submitted at the meeting of the Shareholders.

The attention of the Company's Engineer, Mr. Baker, has been recently directed to a thorough examination of the services from the mains supplying customers. The result has been to show the great importance of the work, many of the services being in such a defective state as to cause a great waste of gas, and consequent loss to the Company. This work has involved a considerable increase in the cost under the head of distribution of gas, but your Directors confidently hope that the per centage of loss by condensation, leakage, &c., although favourable as compared with other Companies, will be considerably lessened by this work.

The ordinary business of the Company has been conducted to the entire satisfaction of your Directors.

The Directors retiring by rotation are Messrs. Davies, Minty, and Trendell, and the retiring Auditor, is Mr. John Egginton. These gentlemen are eligible, and offer themselves for re-election.

## Dr.—Revenue Account, for the Half Year ended Dec. 31, 1877.

To Manufacture of gas—		
Coals delivered	£5,985	7 4
Purifying materials	57	9 3
Salaries, &c.	270	0 0
Wages	1,673	16 1
Repair and maintenance of works and plant (including renewal of retorts), machines, apparatus, tools, materials, and labour	1,063	12 0
Distribution of gas—		
Salaries of Inspectors and Assistant-Inspectors	50	14 0
Repair, maintenance, and renewal of mains and of service-pipes, including materials, laying and paving, and labour	1,365	12 10
Repairing, renewing, and refixing meters	444	18 11
Public lamps—Lighting, &c.	203	0 7
Rates and taxes	546	4 2
Management—		
Directors' allowances	125	0 0
Salary of Secretary and for offices	125	0 0
Collector's commission	263	17 1
Stationery, printing, &c.	48	18 9
General establishment charges and incidentals	140	7 6
Auditors' fees	6	6 0
Contingency-fund	£385	0 0
Less charge to mains and maintenance	208	5 0
	176	15 0
Bad debts	49	19 6
Total expenditure	£12,596	16 0
Balance carried to profit and loss account	2,515	19 4
	£15,112	15 4

## Cr.—Revenue Account.

By Sale of gas—		
Private consumers	£11,207	14 0
Public lighting and under contracts	912	1 4
Residual products—		
Coke, less labour	1,905	2 9
Breeze	15	9 6
Tar	658	1 6
Ammoniacal liquor	403	7 4
Rents	10	18 11
	£15,112	15 4

## WAKEFIELD GAS COMPANY.

The Half-Yearly Meeting was held on the 18th ult.—Mr. W. STATTER in the chair.

The following is the report of the Directors:—

The Directors have pleasure in submitting to the Shareholders the accounts for the half year ending Dec. 31, 1877.

The amount divisible amongst the Shareholders is £434 8s. 9d., out of which your Directors recommend the payment of a dividend for the half year ending Dec. 31, 1877, at the rate of £10, £7 10s., and £7 per cent. per annum respectively.

Your Directors have to report that the works and plant are in an efficient state.

The CHAIRMAN, in moving the adoption of the report, alluded at some length to the state of the works of the Company. Everything, he believed, was in excellent condition. The new exhauster had proved a great success; it had enabled them to obtain more gas out of every ton of coal they consumed, and had also increased the quantity of ammoniacal liquor, so that their residual products had increased considerably in quantity, and consequently in value. He thought the machine would pay for itself in two years; and he might also mention that it had improved the purity of the gas. The ammonia was now condensed into liquor and turned into money, instead of being sent into peoples houses. The leakage had also been reduced from 17·22 to 16·6 per cent., and the illuminating power had been maintained above the standard. They had made 65,874,000 feet of gas during the last half year, as against 65,649,000 feet in the previous half year. The increase in the production of gas last half year, as compared with the corresponding half of the previous year, was only a quarter of a million feet. That was the first time for many years past that their increase in the production had been so small; but, considering the very depressed state of trade, the Directors thought that to have made even the slight increase he had just mentioned was very satisfactory. The total amount of their share capital was £85,000, and that did not include £5803 5s. which they had received as premiums on shares. That £5803 received no dividend; the Company got the benefit of it without paying anything for it. The actual amount of their share capital was therefore £90,803 5s. During the half year they had expended £3,401 11s. 3d., the details of which were given. Of that sum £1982 2s. 7d. was for costs incurred in promoting their Special Act; another portion of it was for new purifiers, &c. They had been obliged to put up a new machine for the purpose of testing the quality of the gas they made, and they had also had to provide a new set of books, and the Directors had engaged the services of Mr. Lass, of London, to start the forms of account prescribed by the new Act. The Company were now supplying with gas about 1000 public lamps, which realized £748 9s. 6d. last half year, or at the rate of about £1 10s. per lamp per year. The amount received for gas sold during the last half year, including the £748 9s. 6d. for the lamps, was £8074 5s. 11d., and their total income for the half year was £11,062 9s. 2d. In the profit and loss account, the first item was £4862 11s. 11d. for dividends paid to Shareholders for the half year ending June last, and there was an item of £440 3s. 4d., which was an amount reserved, being the sum then required to pay the backwardation dividends, and to complete the full statutory dividends up to the 30th of June last. There was one item in the profit and loss account which would also, perhaps, require some explanation—viz.; the suspense account, which was an item they had not had before,

and perhaps might not have again. It would perhaps be well for him to explain the meaning of that account. On Mr. Lass, the accountant, going through the Company's accounts for several years past, he found that they had been in the habit of taking one per cent. to cover loss by estimated bad debts, but it seemed that they had taken rather more than they actually required, as their bad debts did not come up to one per cent. The Directors, therefore, thought it was only right to the Shareholders that, on the actual amount being arrived at after a thorough investigation of the accounts, it should be put down, and therefore they had debited themselves with £180 17s. 4d., which was the amount they had allowed over and above the actual loss they had sustained by bad debts, and they called it the Suspense Account, for want of a better name. The next account to which he would refer was the insurance fund account. The Company were now required to have an insurance-fund equal to one per cent. on the profits of the half year, and therefore they had put £425 to the account from the profits of the last half year. The profit for the half year was £4344 8s. 9d., and, after paying the usual dividends, it would leave £744 17s. 1d. to carry forward to the current half year's account. The Directors proposed to call that £744 17s. 1d. the commencement of a reserve-fund, for at present they had no reserve, it having been all expended in paying the backwardation dividends.

Mr. G. H. WESTERMAN seconded the motion, which, after a long conversation, was put and carried.

The CHAIRMAN, in reply to Mr. Watson, said an arrangement had been made by the Directors to give up their right to light the district of Warmfield with gas to the Normanton Gas Company.

Mr. WATSON proposed a resolution authorizing the Directors to oppose the Normanton Gas Company's Bill, unless the clause referred to was withdrawn.

The resolution, on being seconded, was carried; whereupon the Chairman, who is also the Chairman of the Normanton Gas Company, intimated that in order to prevent opposition the clause would be withdrawn by the Normanton Company.

The usual dividends were ordered to be paid, as well as backwardation dividends of 6s. 3d. per share on each £25 share, 1s. 2d. on each 1847 £5 share, and 4d. on each 1853 £5 share.

A proposition was made that the stipend of the Directors should be increased from £20 to £50 each. On being put, it was lost by one vote.

A vote of thanks was given to the Chairman and Directors.

## BARNSELEY GAS COMPANY.

The Annual Meeting was held on the 18th ult., when the following report and balance-sheet were presented:—

The Directors have pleasure in submitting to the Shareholders the audited statement of accounts for the year ended Dec. 31, 1877, and in recommending the payment of the full statutory dividends, as, after payment thereof, there will be a balance of £1422 9s. 1d. to carry to the reserve-fund.

The reserve-fund now exceeding £4000 (which is equivalent to 40 per cent. of the maximum amount fixed by the Gas-Works Clauses Act, 1847), the Directors have felt justified in reducing the price of gas in accordance with the intimation given in their report for the year ended Dec. 31, 1876, and they beg, therefore, to inform the Shareholders and consumers by meter, that the price, as from the 1st day of January last, will be reduced 3d. per 1000 cubic feet.

The Directors have to report that the works are in a thorough and efficient state of repair.

The retiring Directors are Mr. Richard Inns and Mr. John Jubb Hinchliffe, who, being eligible, offer themselves for re-election. A Director will also have to be elected in the room of the late Mr. Thomas Cope, who, however, would have had to vacate his seat by rotation if he had been living.

The retiring Auditor is Mr. Thomas Bates, and as he possesses the necessary qualification, he offers himself for re-election.

Dr.	Capital Account, for the Year ended Dec. 31, 1877.	Cr.
General capital stock, 1852	£40,000	0 0
Class C preference shares	10,000	0 0
D shares	20,000	0 0
E shares	10,000	0 0
Loans, sundry persons	5,600	0 0
Do., reserve-fund	1,500	0 0
	£87,100	0 0

Dr.	Revenue Account.	Cr.
Gas	£16,006	2 0
Meters	1,012	11 2
Coke	1,466	15 7
Tar and lime	1,142	7 9
Ammoniacal liquor	504	18 0
Sundries	97	19 5
Carriage of coke	98	9 10
Bad debts recovered	0	8 0
	£20,329	11 9
Coal, 10,213 tons		£4,539 19 11
Lime, 531 tons		305 8 4
Salaries—viz., Secretary and Manager, Assistant-Manager, Auditors, Solicitor, and Office Clerks		838 0 0
Wages		3,480 2 10
Rates and taxes		677 16 9
Repairs and renewals		1,166 3 8
Law charges		9 6 10
Carriage of coke		97 15 7
Commission, less interest		6 3 6
Interest on loans		329 6 0
Directors allowance		100 0 0
Discounts, abatements, and bad debts		765 8 7
Net profit carried to dividend account		8,013 19 9
	£20,329	11 9

## WOLVERHAMPTON GAS COMPANY.

The Half-Yearly Meeting was held on Tuesday, the 26th ult.—Mr. J. UNDERHILL in the chair.

The following report of the Directors was submitted:—

Your Directors have much pleasure in presenting their fifty-second half-yearly balance-sheet and statement of accounts, duly certified by your Auditor, showing the revenue for the half year ending Dec. 31 to be £26,857 10s. 7d., and the expenditure £19,105 5s. 10d., leaving a balance of £7752 4s. 9d., which, added to the balance of last account, amounts to £8025 9s. 8d. From this your Directors recommend the payment of a 5 per cent. dividend upon the consolidated stock, and 3 per cent. (less income-tax) upon the paid-up capital of the preference shares, payable forthwith, if approved by the meeting.

Your Directors have much pleasure in announcing a reduction in the price of gas of 2d. per 1000 cubic feet, on and after April 1 next, making the price 2s. 7d. per 1000 feet. During the past half year, part of the extensions at your Stafford Road works have been completed, but owing to the dullness of trade, the new parts were only required for a short time. Should trade revive previous to next winter, the Company will be capable of supplying any quantity of gas that may be required.

There has been a considerable increase in the smaller consumers of gas, which has compensated for the falling off in the consumption of the larger customers. The whole of your works are in good order, but, as usual during the summer, several small mains will require to be taken up, and larger ones laid in their places. Some further machinery at your Stafford Road works will be required to render them complete.

Since the last meeting your Directors have to regret the loss of Mr. R. Warner, who died a short time ago, and as his death has occurred so recently, it is not proposed to fill up the vacancy at present. Three of your Directors retire by rotation at the meeting—namely, Mr. J. Underhill, Mr. H. W. Owen, and Mr. H. Loveridge, but offer themselves for re-election. Your Auditor, Mr. Smith, also retires, but offers himself for re-election.

In conclusion, your Directors beg to assure you they will continue to devote their best attention to the interests you have committed to their care.

The CHAIRMAN moved the adoption of the report and accounts, remarking



that the report was extremely favourable—indeed, he thought he might almost say that it was one of the most favourable that the Directors had had the pleasure of putting before the Shareholders for many years past. He was very happy to think that, after the somewhat long period of gloom through which the Company had passed, consequent on the high price of coal, they were at length beginning to emerge out of that gloom, and once more take their old position as a prosperous and successful Company. They had gone through the period to which he had referred extremely well, and it was very satisfactory, now that the time of difficulty was over, that they were, as he had remarked, able to present one of the most agreeable balance-sheets that had been laid before the Shareholders for many years past. Their receipts from gas and other sources of revenue were £2000 in excess of what they were in the corresponding period of last year, and he might say that the balance they had in hand would enable them not only to pay the usual rate of dividend, and to restore their reserve-fund to almost, if not quite, the amount at which it stood before the increased price of coal interfered with their usual course of trade, but, in addition to this, to carry forward a sufficient balance, without any reasonable fear of loss from the step which the Directors had taken, as announced in the report, to reduce the price of gas. He had no doubt that announcement would be gratifying to all of them. The amount of the proposed reduction—2d. per 1000 cubic feet—would bring the price of gas down to 2s. 7d., which would be within a penny of the lowest rate to which the price had ever been reduced in the history of the Company. He could assure them it was a matter of great congratulation to the Directors that they were enabled to do this. Hitherto the desire of the Directors had always been to provide the public with good gas at the lowest possible rate, and never but on one occasion—and that was owing to the great increase in the price of coal—had they gone back from that policy. He hoped that in the future they would still be able to go forward in the same course. As he had said, they had now brought the price of gas down to 2s. 7d. per 1000 feet, and he hoped that before long they would be able to reduce it still further to 2s. 6d. per 1000. He would not pledge the Directors at present to endeavour to make a reduction below that sum, because their desire was to devote their attention to improving the quality of the gas rather than making any further reduction, considering that an improvement in the quality of the gas was equivalent to a reduction in price; in fact, he believed that a better quality of gas was even more important than a mere reduction in price. There was one paragraph in the report to which he would direct attention, as referring more particularly to small consumers. Some Companies made it a rule to allow a reduction off their stated price to large consumers, but this Company had of late years departed from that policy, and adopted the plan of charging the same price, without any reduction, to all classes of their consumers, whether large or small, the desire being to induce the great bulk of the people—the small householders—to have gas in their houses, feeling sure that there was nothing more convenient or economical to working men than to have gas in their houses. With respect to the extension of the works on the Stafford Road, he was glad to say they were now completed, but the state of trade had not required them to make use of their new works to their full capacity, although they had drawn upon their increased resources to some extent for a short time during the past season. There was one other remark he desired to make, and that was that he could scarcely recollect the time when they had had so few complaints as they had had this winter, and he thought they might regard this as evidence that the public had been well satisfied, both as to the supply and the quality of the gas. He had nothing further to say, except to repeat what the Directors said at the close of their report, that they would continue in the future, as they had in the past, to do the best they could in the management of the undertaking under their charge for the interests of all concerned.

Mr. OWEN seconded the motion, which was agreed to, and the dividends recommended in the report were declared. The retiring Directors and Auditor were re-elected, and thanks were voted to the Directors.

The CHAIRMAN, in acknowledging the latter, took the opportunity of proposing the thanks of the meeting to Mr. Annan, the Engineer, Mr. Jones, the Secretary, and other officers of the Company. He said in a Company like that a great deal depended upon the officials, and it was no doubt due, in a great measure, to the careful management and prudence on the part of the officials of the Company, that the undertaking was in so good a position as it was that day.

Mr. IRONMONGER seconded the motion, because he could fully confirm all that the Chairman had said. They had in Mr. Annan a good practical Engineer, who thoroughly understood the science of gas-making, and both he and the other officials of the Company were well deserving of their thanks.

The motion having been carried, Mr. ANNAN briefly acknowledged the compliment, and the proceedings terminated.

#### CANTERBURY GAS AND WATER COMPANY.

The Half-Yearly Meeting was held on Friday, the 22nd ult., Mr. G. FURLEY in the chair.

The report of the Directors was as follows:—

The Directors, in submitting the statement of accounts and balance-sheet of the Company for the half year ending Dec. 31, 1877, have again the pleasure of congratulating the Shareholders upon the satisfactory state of the Company's affairs. Since the last half-yearly meeting the new gasholder and retort-house, then in course of erection, have been satisfactorily completed by the Contractors, and all accounts connected therewith discharged.

Your Directors, with the view of meeting the increased demand for water in the city, have found it necessary to order an additional and much larger steam-boiler at the water-works. Contracts have been entered into for the supply of this boiler, and for the necessary alterations in the building where it is to be erected. A portion of the cost of this work will be paid for by the surplus funds realized at the sale of the Company's B shares. The further works which your Directors find necessary to be carried out are, an enlarged store for oxide of iron, the removal of the sulphate of ammonia apparatus from the present retort-house, and its re-erection on a more convenient site, and the erection of a suitable building in the yard for keeping the various stores and fittings belonging to the Company. With these alterations your Directors trust that, unless compelled, by the increasing demand for gas and water, to make further extensions, the Company's plant and works will be in first-rate order for the supply of gas and water to the consumers.

The balance standing to the credit of the profit and loss account is £3613 5s. 6d., and your Directors are gratified in being able to recommend that a dividend for the half year after the rate of 8 per cent. per annum, free from income-tax, be declared, and paid on and after Monday, the 25th Feb.

The CHAIRMAN, in moving the adoption of the report, congratulated the Shareholders on its satisfactory character. He remarked that the Directors had been obliged to have an additional and much larger boiler erected at the water-works, to meet the increased demand for water in the city. The water business had progressed so steadily of late, that they found they had not sufficient machinery to do the work required. The reason they needed a larger supply was owing to the water-works at the barracks being out of order, and the authorities having come to them for water. When he told the meeting that the barracks required 7000 gallons of water a day, they could imagine what inconvenience they were put to in supplying such a large increase of water with their present machinery. The Directors had entered into a satisfactory arrangement with the authorities, and they were trying to come to a permanent arrangement. The ques-

tion was whether the authorities would put the water-works at the barracks in repair, or whether they would come to terms with the Company. An engineer was recently sent down with regard to the matter; he expressed himself satisfied with the Company's terms, and reported on the subject to the War Office. If the authorities agreed to have their water, it would be necessary to provide larger storage. The Company would then have to erect another reservoir at St. Thomas's Hill. With regard to the gas-works, they had found it necessary to have an enlarged store for oxide of iron, and to remove the sulphate of ammonia apparatus from the present retort-house to a more convenient site. They also considered it desirable to erect a suitable building in the yard, for keeping the various stores and fittings belonging to the Company, in order that it might be under the eyes of the Manager. They had overdrawn on the capital account to the amount of £4241 16s. 10d. In 1874 they raised £2000, in order to pay off the debt on the capital account, and it would be for the Directors to consider whether they could not raise the money to clear off the amount now overdrawn. The question was whether they could get a loan for £4000, extending over seven years, at the rate of 4 per cent. If, however, it was found necessary to do so, there would be a special meeting of the Shareholders to consider the matter.

Mr. MARTIN seconded the motion, which was put and carried.

The dividends recommended in the report were declared. The sum of £250 was voted to the Directors for their services in the past year, and the retiring Directors and Auditor were re-elected.

The proceedings closed with the usual vote of thanks to the Chairman and the other Members of the Board.

#### SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

The Half-Yearly Meeting of this Company was held at Birmingham on Thursday, the 21st ult.—Mr. F. JAMES in the chair.

The following report of the Directors was submitted:—

The statement of accounts to Dec. 31, 1877, shows an increase in the half year's water-rates of £224 5s. 7d., and the number of houses supplied has increased by 740, making the total 29,209.

After providing for interest on loans, debenture stock, and preference shares, the amount of profit remaining for division (including the balance brought forward from last half year) is £11,635 17s. 7d., and your Directors recommend the declaration of a dividend on the amount paid up on ordinary shares for the half year at the rate of 5 per cent. per annum less income-tax; the warrants for the payment of the same to be issued on Friday, March 1, 1878. The amount of this dividend will be £6875 18s., and there will remain a balance of £4759 19s. 7d. to be carried forward to the credit of next half year.

Your Directors, at the same time, think it well to remind the Shareholders that the whole of the interest on capital expended on new works in course of construction is charged each half year against revenue. The new works are receiving the constant and earnest attention of your Directors, but the progress made during the half year just ended does not call for special remark in this report.

It has been deemed advisable to apply to Parliament for power to construct a reservoir at Burton, and to make certain additions to the works at Lichfield, and the Bill for these purposes will be submitted to the Shareholders for approval at a special meeting to be held this day after the ordinary meeting.

The CHAIRMAN, in moving the adoption of the report, said he thought very few explanations were required. Upon the capital account they had expended during the past year £33,789. The ordinary extension of the Company accounted for £6000, and the balance of £27,000 was part and parcel of the contracts entered into with reference to new works. The ordinary extensions in the way of pipes in the Company's district necessarily meant an increased revenue to the Company. On the other side of the account, it would be seen that the debentures paid off during the past half year had been £5400. He wished to direct attention to that item with the view of expressing a hope that the mortgage bonds might appear each half year in diminution, and that the debenture stock might increase. About a year and a half ago, when they determined to issue debenture stock, it was thought that the 4 per cent. which they offered was very small, and that they would not succeed. He was happy to say that it had been entirely successful, and, with one single exception, which was at the same rate of interest, not a debenture had been renewed since the issuing of the stock. He wished also to point out the absolute security of the debenture stock. The revenue of the Company, which was an increasing one, stood at the present moment at £45,000 a year. The working charges were about £17,000, so that there was £28,000 a year upon which the interest of the debenture stock was a first charge. They were only entitled to issue debenture stock to the extent of one-fourth of the paid-up capital, so that there could be no sounder security than the 4 per cent. debenture stock of the Company. Nothing short of an earthquake swallowing up the works could interfere with them; and he hoped that the renewal of debentures would cease as they fell in. With regard to the profit and loss account for the half year, it would be seen that there was an increased water-rate for the last half year of £900, and there had been something like 700 additional houses supplied with water, though the whole of those houses had not yet come under charge. At the same time, he could not disguise from them that the water-rate was not quite equal to the corresponding half year of 1877. The falling off was entirely due to trade supplies, and it would be quite possible to put their hands upon a few concerns which would account for the whole of it. They had now in charge something like 30,000 houses, which, with a population of five to each house, represented 150,000 people whom they supplied with water. They had, however, parliamentary authority over a district comprising half a million people, and it was not unreasonable to suppose they would yearly obtain an increased number of houses. On the other side of the account, it would be seen that the engine charges were pretty much the same as usual; but the "Maintenance of works," which last half year was swollen by £200 or so from damage to pipes from mining operations, was this year swollen by £300 over the corresponding period, by an accident to an engine at Lichfield. The rates had increased to something like £360 more than the corresponding half of last year, but this was a matter over which the Directors had no control, beyond seeing that the Local Authorities did not assess them at a higher rate than they were legally entitled to do. The law charges showed an increase of about £100; but it would be evident that, with a district extending from Burton-on-Trent to Stourbridge, and of corresponding width, a considerable expense must be incurred in watching the operations of various public companies which might affect their interests. The result of the half year's operations was that they brought down a balance of £11,635 17s. 7d. Perhaps some of the Shareholders would think that the paying of a 5 per cent. dividend, after paying 6 per cent., was not a satisfactory proceeding; but he thought he would be able to show them that the Directors had acted wisely in recommending it. Nearly three years ago they went to Parliament for additional powers, and since that time they had expended on capital account something like £202,000. About £50,000 had been spent in ordinary extensions of their old works, which they would have been bound to incur under any circumstances; but the remaining £150,000 had been spent upon new works, from which the Company had not yet received a farthing benefit. The interest upon that £150,000 had been paid each half year out of the ordinary revenue of the Company. Their responsibility to Parliament would, sooner or later, have necessitated the spending of that sum, so that they might be in a position to supply water to any part of their district whenever they were called upon, and he



thought it would be seen that it was wise to have such an amount of revenue in hand as would enable them to pay the interest on the sum he had mentioned, and keep up their dividend at the same time, rather than to pay 6 per cent. for this and perhaps the next half year, and then have a sudden drop. The Directors proposed, therefore, to carry forward £4759 to the next half year.

Mr. BROWN seconded the motion.

Mr. R. WILLIAMS asked whether the additional capital had been expended to improve the supply of water to their present constituency, or whether it was in anticipation of an extension of their constituency.

The CHAIRMAN said that, so far as the present demand was concerned, they had ample supply. The expenditure of £150,000 was made in anticipation of the demand which the district might make upon them in the future, and with which they might reasonably look forward to an increased revenue. With regard to the creation of new capital, he might state that they had £34,000 uncalled of capital already created, and, when that was called up they had power to issue debenture stock, and the two together would amount to about £52,000. That would leave unprovided for, even under existing contracts, between £25,000 and £30,000. The last call on the present shares would probably be made in May or June, and in six months time it would be necessary to ask the Shareholders to authorize the issue of new capital in a form not yet decided upon.

The report was adopted, and a resolution was passed declaring a dividend on the ordinary capital at the rate of 5 per cent. per annum. Messrs. J. N. Brown, W. H. Holland, and H. Wiggins, retiring Directors, were re-elected.

The meeting was then made special, when the Directors submitted a Bill to obtain powers for the construction of a new reservoir at Burton-on-Trent, and other works, and to confer on the Company powers to raise (in case at any future time it should be thought advisable) £150,000 by shares, and power to borrow to the extent of one-fourth of such shares when paid up.

The CHAIRMAN stated that at present the Company's supply of water at Burton was by means of a main from Lichfield. There was no storage provision, which was required to enable them to supply Burton with a large quantity of water in a very short time.

The approval of the meeting was given to the Bill, and a vote of thanks to the Chairman and Directors concluded the proceedings.

#### NEWCASTLE AND GATESHEAD WATER COMPANY.

The Annual Meeting was held on the 26th ult.—Alderman PLUMMER in the chair.

The Directors submitted the following report:—

The Directors present the usual annual accounts, from which it will be seen that, for the first time in the history of the Company, the revenue shows a decrease on that of the preceding year. The following is the comparison with last year:—

	Tenants.	Receipts.
Year ending Feb. 1, 1877 . . .	54,410	£52,463 3 11
Year ending Feb. 1, 1878 . . .	56,451	52,203 6 6

While there has been an increase in the number of domestic consumers of 2041, the falling off in the gross receipts amounts to £259 17s. 5d., which is to be attributed to the severe commercial depression which is affecting all branches of industry, and materially reducing the consumption of water by meter.

The engine and works at Wylam, the 30-inch pipe connecting the same with the great southern reservoir, and the separate system of pipes for the supply of Tyne water for manufacturing purposes, are now completed, and ready for operation when required.

The filter-beds at Throckley would have been finished except for an accident which happened to the retaining wall, which will necessarily cause some delay. There are, however, four filters now in operation.

The construction of a reservoir and aqueduct on the Swin Burn, for which an Act was obtained last session, will be commenced in the spring.

The following are the lengths and dimensions of the mains laid during the year:—

2 inches . . . . .	879 yards.
3 " . . . . .	13,821 "
4 " . . . . .	8,566 "
6 " . . . . .	1,962 "
8 " . . . . .	373 "
10 " . . . . .	153 "
12 " . . . . .	927 "
	26,675 yards.

Or 15 miles 275 yds.

For the separate supply for trade purposes, the following have been laid:—

4 inches . . . . .	4,887 yards.
6 " . . . . .	2,245 "
8 " . . . . .	3,951 "
10 " . . . . .	7,311 "
12 " . . . . .	690 "
18 " . . . . .	459 "
	19,543 yards.

Or 11 miles 181 yds.

An interim dividend, at the rate of 6 per cent. per annum, having been paid in August, the Directors recommend that a dividend at the same rate, for the half year ending Feb. 1, on the ordinary stock, and of 5 per cent. on the preference shares, be paid on the 8th of March.

The Directors retiring by rotation are Mr. Allhusen and Mr. Brown, who are eligible for re-election.

The CHAIRMAN, in moving the adoption of the report, said it would be observed that they were not in so flourishing a condition as in the previous year, owing to the depressed state of trade and a combination of circumstances. Still he did not think they had any reason to be cast down. He thought their prospects upon the whole were not bad. He was glad to hear from several Shareholders in private that the report was quite as favourable as they had been prepared for. As they would see by it, the tenants at the end of last year numbered 54,410, and the profits were £52,463; for the year ending Feb. 1, 1878, the number of tenants was 56,451, and the profits £52,203; showing that while there was an increase in the number of domestic consumers of 2041, there was a decrease in the profits of £259. This was attributable to the commercial depression which was affecting all branches of industry, the consumption by meter having been materially reduced. It was the first year since the establishment of the Company that they had had to report a decrease. In 1869 the increase in the number of tenants was 1154, and the increase in receipts £1578; in 1870 the increase in tenants 2507, increase in receipts £2409; in 1871, increase tenants 2776, increase receipts £2027; in 1872, increase tenants 1765, increase receipts £4128; 1873, increase tenants 1825, increase receipts £4173; 1874, increase tenants 1835, increase receipts £776; 1875, increase tenants 3487, increase receipts £3178; 1876, increase tenants 3514, increase receipts £1651. In the eight years the average increase of tenants had been 2358, and the increase of receipts £2565. The manufactories had many of them only been half employed, and some smaller ones had almost been closed altogether; and this explained the receipts having decreased by £259 this year. It was hoped the depression would not continue much longer; but, taking the whole statement, he did not think that the Shareholders had any reason to be depressed. As to the Wylam engine-works, and the separate system of pipes for the supply of Tyne water, they had completed that work, and he was glad to say that they had not pumped from the Tyne for the domestic supply for upwards of two years. They were now prepared to pump from the Tyne for manufacturing purposes, though they hoped it would be a long time

before they had to do it. At the same time, it was a very comfortable thing to know that, should it be required, they were now all ready to supply manufactories from the river. With respect to the delay by accident in the completion of the Throckley filter-beds, it was one of those things on which there was a difference of opinion as to the cause. The matter was now in the hands of the Engineer, who was expected almost daily from special parliamentary business on which he was engaged in London. In reference to the construction of a reservoir and aqueduct on the Swin Burn, they had hoped to be almost ready to commence by this time. They had got the plans, which the contractors had been examining for some time, and the specification and tenders; but there was some little difficulty and delay in getting possession of the land, at least, the greater portion of it. Their Solicitor and the Solicitor to the owner of the largest portion of the land had not completed their arrangements, or they would have put the Contractors in possession. They hoped only a few days would elapse, however, before they were able to do that. In addition to the mains mentioned in the report as having been laid, he might say that they would, in a very few days, have finished about two miles of pipes—one mile and a half of 12-inch, and half a mile of 7-inch—from the Fenham reservoir to Arthur's Hill pumping-engine. The object of that was to supply the higher part of the town. From a deficiency of pressure in Elswick and Westgate, there had been several complaints from these parts of the town; but this work, which would be completed in a very short time—he believed in about a fortnight—he had not the slightest hesitation in saying would remedy the deficiency.

Alderman POTTER seconded the motion, and said there was only one observation he wished to make. It was, that the receipts this year showed that the Water Company, like every other Company dependent upon trade, had been affected by the depression. It was satisfactory to them to know, however, that when trade revived, they had everything in readiness to supply all the manufactories. He hoped it would prove profitable to them, and that their receipts would be very much increased indeed.

The motion having been carried, the retiring Directors and Auditor were re-elected.

The CHAIRMAN then moved—"That a dividend of 6 per cent. be declared for the half year ending Feb. 1, on ordinary stock, and 5 per cent. on preference shares."

Mr. CRUDDAS seconded the motion, which was passed.

A vote of thanks to the Chairman terminated the meeting.

#### MANCHESTER CORPORATION WATER SUPPLY.

At the Meeting of the Manchester City Council, on Wednesday, the 13th ult.—the Mayor (Alderman Grundy) presiding,

The annual report of the Water-Works Committee was submitted:—

The amount of estimated available rates outstanding on Dec. 31 last, out of a gross sum of £30,531, was £288; and of rentals £295, out of a gross sum of £121,373. No arrears on account of rates or rentals for any previous year are outstanding. The testing and stamping of water-fittings continues to progress satisfactorily. During the year, 51,084 water-fittings have been examined and tested, of which 48,995 have been passed and stamped, and, on inspection, the whole of such fittings have been subsequently proved to have successfully stood the pressure of water. The expenses attending the stamping office have, as in previous years, been entirely defrayed by the fees received. During the year, the internal water-fittings in 41,244 houses, warehouses, and other premises, have been inspected, and waste therein prevented, where necessary, by putting the fittings into proper repair, in accordance with the Committee's regulations. 5414 cases of inspection of rates, and 4636 cases of rentals, have been examined by the Inspector and his assistants during the year, and have subsequently been dealt with by the Sale and Supply Sub-Committee. During the year, 5 miles and 304 yards of new iron piping have been laid in place of old piping, on renewals account. Upwards of 23½ miles of iron piping have been laid in extensions in various townships during the past year. The Committee have made connections to 7261 additional houses and other premises by means of upwards of six miles of lead piping, at an expense of £1676. An unlimited and continuous supply of water has been provided for all purposes within the limits of the Corporation, and the full quantity of water due to the millowners on the River Etherow for compensation, as required by Act of Parliament, has also been delivered. During the past year, the Committee have paid out of revenue an additional amount of interest accruing upon the further cost incurred for new works. They have again set apart a sum in the revenue account for the renewal of old mains and service-mains for the present year. The whole of the works in connection with the Woodland reservoir are in good order, and the water has been held, as circumstances would allow, up to top water-level. The works at the embankment of this reservoir are in good condition. A slight repair was required in the puddle lining on the solid ground in October. This has been done, and the reservoir is now being gradually refilled with water. The new works at the Bottoms reservoir are now practically completed, except a little walling and dressing up. The entrance lodge remains to be built. The three new reservoirs at Denton and Audenshaw were duly advertised to be let on March 23, and many tenders were sent in for the work, which was finally entrusted to Messrs. Benton and Woodwises. Though the season has been unusually wet, they are making satisfactory progress with the work. The works of the sewer for the diversion of the drainage round the existing Gorton reservoirs have been in progress during the year. The construction of it under the branch canal to Stockport was successfully executed in Whit-week. The locomotive tramway has been laid down nearly the whole length of the work, and the foundations for the aqueducts for crossing the arms of the reservoir are proceeding; but in consequence of the limited means of drawing off the water from the Upper Gorton reservoir and the constant rain, this work has been very much impeded. The cleansing out of the upper end of the Upper Gorton reservoir has been in progress, and the material taken to fill up the shallow arm of the reservoir at Sammy Clough. The stoning of the sides is making fair progress.

The following are the estimates for the ensuing year, omitting shillings and pence:—

Dr.—Estimated Income.

To Public rate of 3d. in the pound on an assessment of £2,158,459 . . . . .	£26,710
Loss 1 per cent. for loss in collection, and which rate, it is estimated, will raise about . . . . .	26,139
Domestic rate of 9d. in the pound on an assessment of £307,349 7s. . . . .	£2,900
Including a minimum charge on cottages—viz., 4s. each for cottages externally supplied with water, and 5s. each for cottages internally supplied, deducting 20 per cent. for compensation and 5 per cent. for loss in collection on the remainder—and which rate, it is estimated, will raise about . . . . .	26,139
Estimated receipts for the supply of water for the purposes of manufacture within the limits of the city, after deducting 1 per cent. for loss in collection. . . . .	£23,147
Estimated receipts for the supply of water to warehouses, shops, offices, &c. (not being private dwelling-houses), within the limits of the city, after deducting 1 per cent. for loss in collection . . . . .	17,078
Estimated receipts for the supply of water for the purposes of manufacture beyond the limits of the city, after deducting 1 per cent. for loss in collection. . . . .	13,479
Estimated receipts for the supply of water to warehouses, shops, offices, &c. (not being private dwelling-houses), beyond the limits of the city, after deducting 1 per cent. for loss in collection . . . . .	2,190
Estimated receipts for water supplied for domestic purposes beyond the limits of the city, after deducting 2 per cent. for loss in collection. . . . .	56,096
Estimated receipts for water supplied to Local Authorities and Companies . . . . .	6,790
Annual payment from Salford . . . . .	6,500
Chief and other rents . . . . .	£3,116
Miscellaneous receipts . . . . .	300
Bankers and other interest . . . . .	4,000
Estimated deficiency . . . . .	9,265
Total . . . . .	£200,814



Cr.—Estimated Expenditure.

By Excess of liabilities, 1877		£21,080
Interest upon the mortgage debt of the late Water-Works Company—viz., £7500 at 4 per cent.	£7,500	£300
Interest upon Corporation Water-Works Loans (1847) Act—viz., £11,350 at 4 per cent., £22,500 at 4½ per cent., and £6000 at 5 per cent.	39,850	1,710
Interest upon perpetual annuities at 4 per cent.	74,906	2,996
Interest upon Corporation Water-Works Loans (1854) Act—viz., £452,650 8s. 3d. at 4 per cent., and £2450 at 4½ per cent.	455,100	18,216
Interest upon Corporation Water-Works Loans (1860) Act—viz., £91,961 13s. 9d. at 4 per cent., and £4500 at 4½ per cent.	96,561	3,873
Life annuities.	469,924	18,796
Interest upon Corporation Water-Works Loans (1863) Act—viz., £74,666 13s. 4d. at 3½ per cent., and £25,340 at 4 per cent.	100,006	3,626
Interest upon Corporation Water-Works Loans (1865) Act—viz., £20,885 7s. 7d. at 4 per cent., and £2000 at 4½ per cent.	22,885	920
Interest upon Corporation Water-Works Loans (1867) Act	77,685	3,107
Interest upon Corporation Water-Works Loans (1869) Act	57,489	2,299
Interest upon Corporation Consolidated Stock.	1,016,820	40,672
Interest upon amounts owing for land, compensation, &c., £91 1s. at 3½ per cent., £21,003 12s. 4d. at 4 per cent., and £120 at 5 per cent.	21,214	849
Interest upon amounts to be hereafter borrowed for extension of works	—	1,760
	£2,439,944	99,130
Chief and other rents		5,346
Rates, taxes, and tithes		6,500
Sinking-fund account		38,458
Expenses of working, management, &c., viz.—		
Materials, contracts, wages, and expenses connected with the repairing and upholding of reservoirs, watercourses, conduits, piping, and contingencies, including renewal of mains	£11,000	
Stone beaching and cleaning Upper Gorton reservoir	2,800	
Wages in connection with the general business of the department.	5,000	
Salaries.	4,000	
Collection of water-rates and rentals.	4,000	
Printing, stationery, and advertising	1,000	
Stamps for annuities, &c.	1,000	
Miscellaneous expenditure.	1,000	
Bankers commission.	500	
		30,300
Total		£200,815

On the motion for the adoption of the report,

Alderman CURTIS moved the following amendment—"That the report now submitted be referred back to the Water-Works Committee, to supply the following information—viz., what profit or loss had been made up to Dec. 31, 1877, from the commencement of the period referred to." He had been astonished to hear it stated recently that the Water-Works Committee were in a very good position financially, and that, with reference to their profits, they had during the past year spent something like £100,000 out of the revenue. He failed to see that the Committee had made, during the whole period of their existence, one single penny of profit to the ratepayers of the city. It appeared to him, judging from a statement which the Committee had put into the hands of the members, that they had made a positive loss of £21,080. From the statement furnished in the tables he found, in the profit and loss account for the year ending Dec. 31, 1877, that the excess of liabilities to be carried to 1878 was £21,080 17s. 6d. He had examined the figures for ten years past, and he found that in 1870 there was a liability of only £1 13s. 6d. The following year it jumped up to £4101; next year there was an excess of assets or profits of £13 3s. 10d., and he believed that was the only instance from the commencement of the Water-Works Committee of a profit in the accounts. In the next year there was a deficit of £3914, and in the following year it was £10,008. In 1875 the deficit had increased to £24,240; 1876, £34,812; and for the past year, as he had stated, the deficit was £21,080. It appeared to him a most singular thing that the Council should employ £2,700,000, and that during the whole time that the water-works had been in existence, with the exception of paying the interest on the borrowed money, and setting aside £314,804 for the sinking-fund, there had been no profit whatever made; but that instead there had been a positive loss of £21,080. The Gas Committee, on the contrary, with a capital of £1,000,000, as against £2,500,000, the capital of the Water-Works Committee, had, during the 10 years, handed over to the Improvement Committee £317,205; and they had also a sinking-fund of £284,159 for diminishing the mortgage debt. This showed him that they had been acting on some wrong principle, for during the 26 years that the water-works had been in existence, they had made a loss of £21,080. It showed one of two things—either that they had been acting on wrong information, or that they had been selling at too cheap a rate. He believed that they had been selling, so far as trading purposes were concerned, at sadly too cheap a rate—a much cheaper rate, as far as he could understand, than it could be provided for. They were also charging to the inhabitants outside the city too little. They charged the inhabitants outside the city 1s. in the pound, which covered, not merely the domestic rate, but covered the public rate, because the public rate which they had was simply a question of having the water in the pipes for the purpose of protecting property, or to aid in putting out fires. If they took the 9d. which was paid for the domestic rate, and the 3d., which was also paid for the property in the city, it made up 1s. But what did they do in addition to that? They had a public rate in the city, which came up to £26,128 in 1877. In 1877 the amount received on account of the public rate was £26,128; for the domestic rate, £25,701; and the domestic rate and the public rate together amounted to £51,402. What was the position of things with reference to parties outside the city? All parties outside the city paid 1s. in the pound; therefore the inhabitants of the city—who had to find the means for the establishment of the water-works—were charged £17,134 more than parties were charged outside the city. What did they do with reference to the gas? Instead of selling it at a less price, they charged so much per 1000 more beyond the city than for gas supplied in the city; and he maintained that it cost the Corporation that amount extra, owing to the length of the mains, and the extra cost of supervision outside the city. But they charged the inhabitants of the city £17,000 more than they charged the people outside the city for water. He found that the public rate in 1868 was £18,292, whereas the public rate in 1877 was £26,128. The question was, how had the loss arisen? He believed it arose, to a great extent, from the Committee selling, for trading purposes, water at a much less price than it cost the Committee, or from selling water at too cheap a rate to parties outside the city. The table he had in his hand showed him that if a party consumed 6000 gallons of water in a quarter, they charged him at the rate of 2s.; if he consumed 30,000 gallons, the rate was 1s. 8d.; if he consumed 60,000 gallons, it was 6d.; and if he consumed 3 million gallons, he was charged 5d. per 1000 gallons. The loss of the Water-Works Committee arose from pushing the sale of large quantities of water for trade pur-

poses. He wanted to know authoritatively from the Committee whether he was right in understanding that they had made a loss of £21,000. Then he wanted to know the amount of expenditure on lands and works. That would, of course, include the amount borrowed by the Committee up to Dec. 31, 1877. He also wanted to know the price per 1000 gallons charged to warehouses, shops, offices, &c., and the price charged for trade purposes, and the profit, if any, on the issue of life annuities.

Alderman KING seconded the amendment. He said the dealing in water from a water-works was altogether a different thing from trading in an ordinary way, and while in the one case a large customer would be an advantage, in the other he was a disadvantage. It appeared to him that if a man would take a moderate quantity of water, he was entitled to it at a fair price, but to take a larger quantity brought the Committee nearer to that point when their supplies were exhausted, and was rather injurious to the interests of the Committee than otherwise. He thought the scale of payments ought to increase according to the quantity used, and not decrease. He thought the statement, that the information which was sought to be obtained would be supplied to the opponents of the Thirlmere scheme, was absurd, for the House of Commons Committee, if they required information, could compel the Corporation to give it.

Mr. HARWOOD thought that the information sought for was intended to be used against the Thirlmere scheme, which it was said, by its opponents, had not been undertaken to supply the inhabitants of Manchester with water, but as a commercial speculation. The Committee had lost money, no doubt, in previous years, but it was because they had been paying interest on the 2½ millions of money which their works had cost, and been contributing to a sinking-fund besides. In order to meet the loss they had incurred, the Committee had received the profits of other Committees to the amount of £166,000, but had paid back into the sinking-fund a sum of £314,884, or an excess of £148,000.

Alderman PATTERSON replied to some of the statements made, many of which, he asserted, were fallacious. In the first place, it was said that Mr. Bateman's estimate of the existing works at Longdendale was placed at a certain sum, and that the ultimate cost was four times that amount; then he stated that the Corporation could not get the quantity of water from Thirlmere that they estimated, and that it would be much better to go to Ullswater, the cost being very little more; and, in the third place, he said he really trembled for the financial condition of the Corporation. As to the first point, it appeared, from a report presented to the Council in 1856, that the total cost of the Longdendale works up to that time had been £1,286,000. In a letter which accompanied this report Mr. Bateman said: "The original estimate of the whole work, including land and the piping within the city, was £455,300. The actual cost, as nearly as I am able to ascertain, will be, when the Torside reservoir is repaired, £612,000, being an excess of £156,700. Deducting the city piping and land and compensation, the engineering cost outside the city will be about £420,000, being an excess of about £180,000 over the items of the parliamentary estimate as particularized in the contract with me." That was a correct statement of the case. Mr. Bateman's estimate was exceeded by £180,000, and when they appreciated the great difficulties he had to contend with, that was not an unreasonable excess over his estimate. Since that time the capital of the Water-Works Committee had increased to something like 2½ millions sterling—in fact, it had doubled; and the population they supplied with water had grown from 350,000 to 800,000. To supply this great increase of population the Corporation had had to spend—in addition to the works, and including the purchase and extension of mains—£327,370; in further purchases of land and compensation and new works in the Longdendale valley, including Vale House and Bottoms reservoirs, £418,891; for the Tintwistle tunnel, flood watercourse, and railway, £292,199; for the Prestwich reservoir and new main, £182,000; and then they had had to increase their storage works at Denton and Audenshaw, for which large purchases of land had had to be made. But, whilst they had done all this, the charge for water was one-sixth less than the charge made by the Corporation of Liverpool. Mr. King also alluded to the quantity of water to be got from Thirlmere, and impeached the accuracy of Mr. Bateman's estimate; but, assuming the rainfall was as Mr. King put it, which the Committee would not do, his statements on this matter were very fallacious. His alternative scheme of going to Ullswater had many objections, all of which had been considered. The difference in the cost of works alone between Ullswater and Thirlmere would be at least half a million of money.

Alderman GRAVE said he did not wish to interrupt Mr. Patteson, but if he had had the latest information he would not have made the statement he just had. He had got from Mr. Bateman a very different statement, showing a difference in favour of Thirlmere of £1,030,000. He thought it would be better not to go into these details, which had all to be proved before the proper tribunal.

After some further discussion, Alderman CURTIS consented to withdraw his amendment, with the view of introducing it again in two or three months time, and the report was then adopted.

It was resolved, on the motion of Alderman GRAVE, that a domestic water-rate of 9d. in the pound upon the property within the city liable to be assessed thereto, and a public rate of 3d. in the pound, should be levied for raising the amount required for the expenses connected with the supply of water for the year ending Dec. 31, 1878.

#### LEICESTER WATER-WORKS COMPANY.

The Half-Yearly Meeting of Shareholders was held on Monday, the 18th ult.—Mr. E. S. ELLIS in the chair.

The SECRETARY (Mr. J. H. Williams) read the report of the Directors, as follows:—

The gross receipts for the half year ending Dec. 31, 1877, amounted to	£12,588 16 3
From which deduct—	
Working expenses	£2,107 10 1
Rates	579 15 0
Interest	1,327 8 3
	3,914 13 11
Leaving net profit	£8,574 2 4
Appropriated, as required by the Company's Acts—	
To the Shareholders	£7,196 19 6
To the Local Board of Health	1,377 2 10
	8,574 2 4
From the Shareholders proportion.	£7,196 19 6
Deduct income-tax	105 18 3
	£7,091 1 3
Add balance from last half year	209 3 4
Leaving at the disposal of the Shareholders	£7,300 4 7

From this amount your Directors recommend the payment of a dividend at the rate of 6 per cent. per annum (free from income-tax), leaving a balance of £490 4s. 7d. to be carried forward to the next account.

The expenditure on capital account during the half year amounts to £4937 5s. 10d., of which £2956 9s. 6d. has been laid out upon the Gilroes reservoir, which is now completed and in use.

The revenue of the Company has increased satisfactorily, and has enabled your Directors to recommend a small increase in the rate of dividend.

All the works of the Company are in good condition, and the two storage reservoirs are standing at overflow.



The Bill in which the Corporation seek to attain power to acquire the property and rights of the Company, has been introduced into the House of Lords, read a second time, and is unopposed.

The CHAIRMAN moved the adoption of the report. He said: In referring to the statement of capital account, you will notice the shares issued are all paid up, the whole of the calls having been made. There is a balance of £4400 to the credit of capital account. We have also about £1400 of unissued debenture loans, making altogether the sum on capital account of £5800. It is pretty clear that this sum will be sufficient to cover the further outlay of capital during the current half year, or up to the time that the works will be transferred to the Corporation. We have still about £1000 to pay over of the money reserved for the contract respecting the Gilroes reservoir. Turning, then, to the revenue account, the receipts for this half year are about £750 more than the previous half year. The expenses are also about £130 less than the previous half year, so that the result is that a better balance is carried over to the profit and loss account of about £1000 for the half year. The wages this half year are somewhat in excess of the previous six months, being about £70 more. The superintendence, the sum for wages, and the office expenses, have cost more, and there has been a small addition in petty disbursements; but there has been a saving in repairs of works, in consequence of our having, in the previous half year, laid out a large sum for additional sand for the filter-beds. The law charges are also less by about £90. In the corresponding previous half year we had to pay for the loss of a horse, and the legal expenses connected with the action brought against the Company. The result is that we are able to carry over a balance of £8574 to profit and loss account, and that enables us, after reserving the profits apportioned to the Shareholders, and after dividing one-half of the surplus profits with the Corporation, which amount to £1377, to carry to dividend account the sum of £7196. The Directors, therefore, recommend a dividend at the rate of 6 per cent. per annum, free from income-tax, and then they will be able to carry over a balance of £490 4s. 7d., against a balance brought forward last half year of £209 3s. 4d. The works this half year have, therefore, earned 6 per cent. for the Shareholders, and enabled the Directors to pay £1377 to the Corporation as their share of the profits, and to carry over an additional balance of £280 to the next half year. I trust that this will be a satisfactory statement of the accounts for you. I may remark that the revenue of the Company has been very satisfactory during the past year. The revenue in 1876, the income from house and meter rentals, was £20,664, and from sundries £1567, making a total income of £22,231. For 1877 the rentals amounted to £22,594, and sundries to £1631, making a total for the year of £24,225, showing an increase in the revenue of the Company, for 1877 over 1876, of £1995. It is usual for the Directors to write off the bad debts which occurred in the previous half year but one, and therefore we have written off the various bad debts and arrears up to the end of the year 1876, so that the accounts are clear up to that date. The revenue in 1876 amounted to £21,640, and the total amount of bad debts and errors was £56 15s. only. I think, when you recollect that this revenue is collected from many thousands of small accounts, distributed over the whole of the town, the bad debts and errors amounting to that small sum were not only creditable to the management of the Water-Works Company, but also to the Inhabitants of the town in which so few bad debts were made. I find that in the previous year these bad debts were £57, and in the year previous to that £53 19s. 6d. As the Directors remark in the report, the reservoirs are both running over at the present time, and the works are all in good condition; in fact, I think that the condition of the works, and the report which we have to present this morning, were never more satisfactory than at the present moment.

Mr. W. H. ELLIS seconded the motion, which was put and carried. The dividend recommended in the report was declared, and the retiring Directors and Auditor were re-elected.

The CHAIRMAN, in acknowledging a cordial vote of thanks passed to the Directors, said that he and his colleagues had had pleasure in attending to the business for many years, and he could assure the Shareholders that, although they had bargained to sell the works, and they would probably pass out of their hands in a few months, it was very satisfactory to see that, at the present moment, the accounts were so favourable. If they had foreseen how good they would be, he did not know whether they would not have asked better terms, but it was too late now. They felt great satisfaction in believing that, when the works were handed over to the Corporation, they would be found in a very satisfactory condition.

**KING'S LYNN GAS COMPANY.**—The sixteenth ordinary half-yearly meeting of this Company was held on Friday, the 22nd of February—Mr. J. D. Thew in the chair—when it was resolved, on the motion of the Chairman, seconded by Mr. T. E. Bagge, "That an interim dividend at the rate of 5½ per cent. per annum for the half year ending Dec. 31, 1877, be paid on the capital of the Company." Mr. T. E. Bagge and Mr. J. S. Marsters were re-elected Directors, and Mr. E. L. King an Auditor of the Company.

**CHATHAM AND ROCHESTER WATER-WORKS COMPANY.**—The half-yearly meeting was held on the 19th ult.—Mr. J. Baird in the chair. The Directors in their report congratulated the Proprietors on the continued steady progress of the Company, the receipts for the past half year being sufficient, after providing the usual dividend, to enable the Directors to place the sum of £200 to the reserve account. The Directors recommended that a dividend at the rate of 7 per cent. per annum be paid on all fully paid-up shares. The statement of accounts showed that the capital of the Company was £46,000, the whole of which had been expended. The revenue account showed the receipts during the past half year to have been £5419, leaving, after the payment of all charges payable out of revenue, a balance of profit of £1729 available as dividend. The reserve-fund now amounts to £6089.

**LEOMINSTER GAS AND COKE COMPANY, LIMITED.**—The half-yearly general meeting of Shareholders was held on the 21st ult., when the following report was submitted and adopted:—"The accounts of the Company for the year 1877 are herewith presented. The disposable balance is £341 10s. 10d., out of which the Directors recommend the payment of a dividend at the usual rate of 10 per cent. per annum on the ordinary shares, and 7 per cent. per annum on the B shares for the half year ending the 31st of December last, leaving a balance of £1 0s. 10d. to be carried forward. The dividend warrants to be made payable on the 25th of February. The increase in the consumption of gas by private consumers has been 489,500 feet, being at the rate of nearly 7 per cent. on that of the year 1876. The difficulty of disposing of the coke has tended to diminish the advantages derived from the reduced cost of coal. The net profit would, however, have been much larger had not the expenditure on the renewal of mains, retorts, &c., been greatly above the average amount. The suspense account has also been further reduced by the sum of £80, and ten more retorts have been provided, and are now on the ground. When these have been set, the whole of the retorts will be nearly new, and a very small outlay on renewals is likely to be required for some time to come. The Directors consider the position of the Company to be thoroughly sound and satisfactory."

## MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Eighth Annual and Thirty-third Quarterly Meeting of the above Society was held at the Mitre Hotel, Manchester, on Saturday, the 23rd of February—Mr. SAMUEL HUNTER, Past-President, in the unavoidable absence of Mr. Hutchinson, in the chair.

The minutes of the previous meeting were read and confirmed.

The SECRETARY (Mr. R. Hunter) then read the following report:—

"The Committee, in presenting their eighth annual report, desire to congratulate the members on the continued prosperity of the Institution. Seven members have been added during the year, but the Committee regret that the Institution has lost two members by death—viz., Mr. James Moore, of Stretford, and Mr. S. H. Warren, of Pernambuco. Two gentlemen have withdrawn their names as members, and two others have been struck off the roll, as no longer complying with Rule 1. The total number on the list at present is 71.

"The funds of the Institution are in a satisfactory condition, as will be seen from the statement of accounts supplied to each member.

"The best thanks of the members are due to Mr. Vevers for his interesting paper 'On the Statutory Limits of Gas Supply,' and to Mr. Samuel Hunter for the paper on his condenser; and also to the gentlemen who so kindly furnished particulars of washers, scrubbers, &c., for the interesting exhibition of models and drawings held in August last. The papers read on that occasion have been printed and circulated to the members, and it was hoped to supplement these by an appendix containing information of the various apparatus in use by the Members of this Institution, a circular being issued inviting the necessary information, and the Committee tender their thanks to those members who have kindly replied to the questions put, and for the information given. These replies have been tabulated, and are now in the hands of the printer, and will be circulated as soon as possible.

"The thanks of the members are due to the Gas Committee of the Manchester Corporation for the permission so kindly given to inspect their works at Rochdale Road, in May last, and also to Mr. Braddock for his courtesy and kindness on that occasion. Thanks are also due to Mr. Jacques, Past-President, and to the Gas Committee of Stockport, for their invitation to inspect their new works at Portwood, and for the courtesy and attention given to the members on their visit. In conclusion, the thanks of the members are due to the retiring President, Mr. Hutchinson, for his services during the past year."

The election of officers for the year 1878 was then proceeded with, with the following results:—

President . . . . .	Mr. David Clarke . . . . .	Ashton-under-Lyne.
Treasurer . . . . .	Mr. Jas. Paterson . . . . .	Warrington.
Hon. Secretary . . . . .	Mr. Robt. Hunter . . . . .	Stalybridge.
	Mr. J. G. Hawkins . . . . .	Wigan.
Committee . . . . .	Mr. Wm. Carr . . . . .	Halifax.
	Mr. Wm. Smith . . . . .	Hyde.
	Mr. S. R. Ogden . . . . .	Blackburn.
Auditors . . . . .	Mr. J. Cockroft . . . . .	Littleborough.
	Mr. Edmund Lord . . . . .	Whitworth.

The newly-elected PRESIDENT (Mr. Clarke) then delivered the following address:—

Gentlemen,—First of all, permit me to assure you that I fully appreciate and highly esteem the honour you have conferred upon me in electing me President of this Institution. It is not without some little diffidence I enter upon the first duty attached to the position—namely, that of addressing you from the chair; but, trusting to your kind forbearance, I am encouraged in the attempt to lay my views before you.

It is with feelings of deep regret I have to inform you that, since our last annual meeting, two of our members have passed away—Mr. Moore, of Stretford, and Mr. Warren, of Pernambuco. The former was well known to the members, and was not only greatly esteemed for his genial disposition, but for his willingness on all occasions to give the members the benefit of his experience. Mr. Warren will long be remembered for the lively interest he exhibited in our discussions; he was a most energetic young man, and his death is more lamentable when we remember he was cut off in the prime of life.

During the year two members have been struck off the list, in consequence of having ceased to be resident Engineers or Managers of gas-works, according to Rule 1, and two have withdrawn.

Twelve months ago our list of members stood at 70; since then we have lost six and enrolled seven, being a gain of one during the year. This small increase may not have a very encouraging appearance; but, remembering that this is only a district Institution, and that none but Engineers and Managers of gas-works are allowed admittance, it would be unreasonable to expect to be constantly enrolling members, for the simple fact that the material must eventually get exhausted. Although this Institution has only been in existence eight years, it now numbers 71 members, representing a capital of about £5,000,000 sterling, carbonizing 900,000 tons of coals, and producing 9000 million cubic feet of gas per annum, which fact is a greater proof of its success than any words of mine can convey, and of its usefulness no one can doubt.

In order to continue our success, it is essential that every member should endeavour to introduce some interesting subject for discussion. Hitherto the papers have been ample, and of such a character as to enable the members to gain a considerable amount of practical information; but it is a matter of regret to find that so few members have been taxed with the preparation and reading of them. To attribute this to your want of interest would, I feel persuaded, be doing you an injustice; let me, therefore, set it down as your modesty in not venturing to come forward unsolicited. I therefore give you a general invitation, with a hope that the Committee in future, instead of being under the necessity of making a personal application, will find their difficulty will be in making the selection of papers. Speaking on this subject, I cannot allow this opportunity to pass without expressing the thanks of the Committee and the members generally to those gentlemen who in August last kindly favoured us with drawings, together with full particulars of their patent washers and scrubbers.

During the year two kindred Associations have been formed—viz., the North of England and Midland Counties—the former having its centre in Newcastle, and the latter in Birmingham. At present, the indications of prosperity are as favourable as any one could hope for, and I sincerely wish them continued success.

Whilst we are congratulating ourselves on the success which has attended this and similar Institutions, there are others who are of opinion that our meetings will have an injurious effect on the Parent Association; and in order to obviate this, it has been suggested that the Local Institutions be managed by a Central Committee of the British Association. I wish to assure the gentlemen holding these opinions that, so far as the Manchester District is concerned, their fears are groundless.

In 1863 the first meeting of the Parent Association was held in this city. The benefits derived from these annual gatherings were very soon perceptible; and it was in order to increase those advantages, by more frequently meeting together, that this, the first District Institution, was formed. It has more than realized the expectations of the pro-



moters. Our frequent meetings have cemented us together as one family, sympathizing and assisting each other in difficulties, and rejoicing in each other's prosperity. Under these circumstances, it can scarcely be expected that a Central Committee will be allowed to interfere with and regulate our proceedings. As a proof of our undiminished loyalty to the Parent Association, I believe every person on our list is also a member of that. We look forward with pleasure to, and attend in considerable numbers at the annual meetings, and are willing to assist in the labours thereof.

During the session of 1877, the Company I have the honour of representing were in Parliament, seeking powers to raise additional capital, &c. In the Company's Special Act of 1847 the auction clause was first introduced. It was intended in their new Act to leave out this clause, and take power to raise fresh capital by allotting the new shares amongst the existing Shareholders; but at the time the Bill was before the Select Committee, Mr. Raikes's well-known Standing Order was passed, which is to the effect that every Company seeking authority to raise additional capital shall make provision for the offer of such capital by public auction or tender, the premiums realized by the sale to be applied to capital bearing no dividend. This necessitated the withdrawal of the Company's clause, the new Standing Order being substituted, coupled with the sliding scale of prices.

The effect of these two Orders will, no doubt, be anxiously watched by all who are interested in the manufacture of gas, more particularly so as they are likely to be the leading principles of legislation in all new Acts for the supply of gas.

From the results of 30 years working of the auction clause, I am decidedly of opinion the consumers derive the greatest benefit.

The sliding scale was first introduced by the Board of Trade in 1875, and adopted by one of the London Companies in that year. The principle of the sliding scale is to fix the standard or initial price, then for every penny charged in excess or diminution of such initial price, the standard rate of dividend for such year shall be reduced or increased 5s. in the £100; in other words, if you reduce the price of gas below the initial price, you are entitled to divide one-quarter per cent. more for every penny—that is, if you can get it. You must first reduce the price of gas to the consumer, but it does not follow that at the end of the year you may not find all the profit exhausted by the reduction.

The principle of paying by results I hold to be good; it will doubtless be the means of arousing those Companies who, having arrived at the power of dividing 10 per cent., carry on a sluggish trade, and are perfectly indifferent as to any further improvements being made; whilst others will be encouraged to continue their exertions to supply gas economically to the public and profitably to themselves; yet I contend that it is inconsistent to have a fixed and unalterable initial price, when the cost of material is subject to such great fluctuations. Would it not be more reasonable to fix the initial price in accordance with the price of material, and let them fall and rise together? For example, we will take the Ashton Gas Act, as before. The initial price was fixed at 3s. 8d. per 1000 feet, the average price of coals being 18s. 6d. per ton. Suppose that the coals be reduced to 16s., the initial price could be reduced to, say, 3s. 6d., and contrariwise if the price of coals increase; whereas in the afore-mentioned Act, the price was fixed without any margin, and at a time when the price of coals was low.

Judging from the legislation of last session, those Companies who chance to be in Parliament when the price of coals is high, are likely to get the most favourable Acts.

The parliamentary proceedings connected with the Bills promoted by the Crystal Palace District and the Chartered Gas Companies, seeking to be relieved from the obnoxious sulphur clauses, were of an interesting character. The matter was thoroughly investigated, and much information is to be obtained from the evidence given. While admitting that it is our duty and advantage to study the interest of consumers, by supplying them with gas of good illuminating power, and of the greatest possible purity, and at such a price as would be compatible with a fair dividend, I am still of opinion, in this case, the remedy is greater than the evil. Although chemistry has of late years made considerable advances, yet it has scarcely arrived at such perfection as to enable us to reduce the sulphur compounds to a minimum, without incurring unnecessary expense in the purifying process.

Whilst feeling thankful that these restrictions do not extend to the provinces, we ought not to relax our exertions, for we may rest assured that they will come; hence it is very desirable Companies should be prepared to meet them.

The electric candle has recently created no little sensation; it was privately exhibited at the East India Docks in June last. Four electric lamps were fixed about 45 feet apart, and, although ground-glass globes were used to subdue the light, it is said that small print could easily be read at a distance of 20 feet. Four lamps were afterwards lighted, each containing four of Bray's No. 6 burners, aided by powerful reflectors, yet the contrast was very marked in favour of the electric light.

An experiment was subsequently made in a large room, with equal satisfaction, and with such apparent success as to cause a little depression in the value of gas shares. In fact, it was held in such estimation by the public as to cause our opponents to rejoice in not having defeated our Bill in Parliament.

The JOURNAL OF GAS LIGHTING has frequently furnished us with a considerable amount of information on this subject, yet it is most difficult to get at the cost, compared with that of gas. Some of the most eminent men connected with the science have for some time been deeply engaged in experimenting, with results varying from four to one in favour of gas, and fifteen to one in favour of electricity. In the face of such conflicting estimates, it is impossible to arrive at the correct value. Recent experiments, made under the most favourable circumstances, only show that it may be used with possible advantage in special cases, such as lighthouses, large open spaces, and public buildings. Judging, therefore, from these circumstances, there is little likelihood of its damaging the interests of Gas Companies.

Public excitement as to the probability of its superseding gas has somewhat cooled down, and will have reason to remain so, until a more agreeable light can be produced, and so subdivided as to be made available for general purposes, which problem is not likely to be solved for some time to come.

Amongst the many improvements lately made in the manufacture of gas, that known as Aitken and Young's patent condensing process deserves our special attention. The advantages claimed are an increase of about 18 per cent. in the illuminating power of gas made from common coal, also a saving of, at least, 12 per cent. in lime used for purifying purposes. This is said to be accomplished by retaining the volatile hydrocarbons, instead of allowing them to be carried away with the tar. This process must of necessity reduce the value of the tar; but the advantages claimed are much in excess of any depreciation, and at a time when the country is calling out for an increase in illuminating power, and supported by Parliament in the face of a limited supply of canal, we must hail with satisfaction any improvement that will assist us to overcome the difficulty, or meet the requirements of the public.

The Pure Carbon Gas Company have issued a prospectus professing to produce 13,000 feet of gas per ton, in place of 10,000 under the ordinary process; both the gas and coke are stated to be of an improved quality, and it is further asserted that the gas can be made by any ordinary labourer at 1s. 6d. per 1000 feet from peat, turf, bones, or other things generally thrown away. Let us hope this may be accomplished; but I cannot avoid the thought that it will follow many other similar inventions, and soon become a thing of the past.

Much attention has latterly been given to the question of condensation, washing and scrubbing, and with considerable advantage. By the improvements effected we are now enabled, not only to remove and retain the whole of the ammonia, but a considerable portion of carbonic acid and sulphuretted hydrogen, thereby increasing the value of the residual products, and reducing the expenses of purification.

The returns just made by the Members of this Institution on this branch of our business are of the utmost importance. By examining and comparing results, you can at once perceive in which particular department your works are efficient, or to what extent deficient. You may also ascertain, from practical results, what is required to bring your works up to a proper standard.

There are a few other matters to which I was desirous of drawing your attention, but circumstances would not permit. I have only, therefore, to ask for your hearty co-operation and kind assistance during my term of office, and, in return, you may rest assured no effort of mine shall be wanting to retain the reputation of this Institution.

Votes of thanks to Mr. Clarke for his able Address, and to the retiring President, Mr. Hutchinson, and to the Treasurer, Secretary, Auditors, and Committee for their services during the past year, were carried.

## IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The week has been very quiet in all respects, and the general state of the iron trade is such that little that possesses the merit of novelty can be written in relation to it. The uncertainty of the political situation has again had a tendency to restrict transactions of all kinds, and it is to be feared that we shall not, in any case, see any revival of business for at least six months to come. Indeed, not a few of those whose long experience entitles their opinions to considerable respect, express their opinion that there will not be any change for the better for another twelve months.

In pig iron there have been a few sales this week, all sorts of prices having been somewhat weak, in consonance with the want of firmness which has characterized other markets. There is a moderate steadiness in the call for the best brands of Derbyshire and Yorkshire foundry pigs; but, even at some of the leading places, there are furnaces out of blast.

Finished iron is, if anything, in a little better request, two or three of the establishments devoted to that class of work having now more men and machinery engaged. Prices, nevertheless, are weak, and not likely to recover. Several of the larger steel firms are busier, to a certain extent, owing to the receipt of Government orders.

In the coal trade matters are quiet, and prices are again down a further 6d. per ton. The question of another reduction of the miners wages will be decided here—certainly in the affirmative—during this week.

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The present month has opened with a downward movement in prices, so far as the Manchester market is concerned, and reductions of 10d. to 1s. 8d. per ton have been made in the delivery prices of the better classes of round coal to private consumers, whilst forge coal and burgy have, in some cases, been reduced 5d. per ton, and in the outside districts there is a levelling down of prices to those which are actually ruling in the open market. In the West Lancashire districts no specified reductions in the list rates are yet announced; but, as I pointed out in a previous report, there is a weakness in prices, and sellers in many cases have no fixed quotations, orders being taken on the best terms that can be obtained. In all classes of round coal there is a continued falling off in the demand, and the inquiries for common coal for iron-making purposes have been affected by the stoppage of some of the large works, in consequence of a reduction in wages. Engine classes of fuel also continue difficult to sell, although slack is, if anything, not quite so plentiful in the market as it has been, and a better sale is now being looked forward to for brick-making purposes. The average quotations at the pit mouth in the Wigan district may be given about as under:—Best Wigan Arley, 10s. to 10s. 6d.; common Arley, 8s. to 9s.; Pemberton four-feet, 8s. to 8s. 6d.; common coal, 6s. to 7s.; forge coal, 5s. 6d. to 6s.; burgy, 4s. 6d. to 5s. 3d.; and good slack, 3s. to 4s. per ton.

Common coal for shipping purposes continues to be offered at very low figures, and can be bought readily at the High Level, Liverpool, at less than 7s. per ton.

In the iron trade there is no material change to notice; the business doing continuing of the most limited character, with a great deal of competition for any orders in the market. Prices, though nominally without alteration, are weak, and although local makers of finished iron are able to offer at lower figures than the north country houses, the producers of common iron are still unable to compete with the outside brands offering here.

Many of the men in the finished iron works are striking against the further reduction of wages, and some of the large works have been stopped.

The meetings of the largest Coal and Iron Companies in this district which have recently been held fully testify to the depression in trade. The Wigan Coal and Iron Company have only declared 2½ per cent., and the larger portion of this has been drawn out of the reserve-fund; whilst nearly the whole of the 10 per cent. declared by Andrew Knowles and Sons has been provided out of the reserve, and the Astley and Tyldesley Coal Company have not declared any dividend at all to the ordinary Shareholders.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There was an increase in the shipments of gas coals last week. The demand, however, is almost exclusively for best gas. The greater proportion of the cargoes, however, which are despatched are coals which have been bought under contract running over the year. The Irish gas-works continue to take the best sorts, which are bought in the open market from 7s. 6d. to 7s. 9d. per ton. Gas coals are likewise being shipped to the Italian ports at low rates of freight. They are little over £12 per keel to Genoa. The trade is being rather overdone, and business had a tendency to fall off somewhat last week. Second-class gas coals do not attract any great amount of attention in the market. Prices are irregular, and a good few of the smaller pits are scarcely working full time. Turns for best gas do not exceed a week at the shipping-places—hardly that in many instances. The steam coal trade is getting on moderately. There was a rush at the termination of the pitmen's strike, but it soon got over, and second-class



steam collieries have very great difficulty in keeping up to anything like decent trade. The price of best steam coal is about 10s. per ton; seconds, from 8s. 6d. to 9s. 6d. The trade for house coal continues very quiet.

Freights are low in the coasting trade. Last week as little as 5s. 6d. per ton was paid a sailing vessel to load gas coals to be discharged at the wharves below London Bridge. The figure is likewise as low for the east coast, and for the British ports of the English Channel. Some cargoes of fire-bricks are being shipped to the French ports, but there is a poor demand for coals thence. The steamers on offer are quite in excess of the requirements of the coasting trade.

The wages of workmen in the chemical trade have been reduced 10 per cent. The chemical business was never known to have been so dull as it is now. Some attempt is being made to adjust the make of pig iron in the Middlesbrough district to the requirements of business. The iron trade is without alteration; prices remain precisely where they were last week. The wages of labourers are coming down very much; they are getting fast back to the old rates of something less than £1 per week.

#### TRADE NOTES FROM SCOTLAND. (FROM OUR OWN CORRESPONDENT.)

The Managers of the several works under the Glasgow Gas Commissioners seem to be resolved on keeping up a pretty high standard of illuminating power in the gas which they respectively make. The lowest minimum found by Dr. Wallace during the week ending the 23rd of February was 25.59 candles, at the western district, where also the average and maximum were, respectively, 27.72 and 29.78 candles. At the other three stations the minimum ranged from 26.26 candles to 27.37 candles; the average from 27.31 candles to 27.94 candles; and the maximum from 27.58 candles to 28.76 candles. It is interesting to note that the gas made at the West Street station (Mr. Key's) during the week was of a very uniform quality, thus:—Minimum, 27.37 candles; maximum, 27.58 candles; average, 27.43 candles. At this point I may mention that the bonuses granted to the four Managers for the excellence of their results during the past year were as follows:—Mr. Key, £140; Mr. Manwell, Dalmarnock station, £100; Mr. Davidson, Dawsholm, £100; Mr. Granger, Partick, £90.

On Thursday last Glasgow Corporation Gas Annuities were firm at the previous quotation of 218½.

The subject of a sufficient water supply for the town of Arbroath is at present receiving a good deal of anxious attention. Some days ago, the clerk of the Police Commission of that town received a letter from the Board of Supervision, informing him that no reply had been received to the Board's former letter with regard to the water supply of Arbroath, and requesting an answer. A reply has since been sent to this communication, to the effect that the question of water supply was under consideration, and that the Board would be informed when a resolution had been come to in reference to it. The scheme proposed is to obtain a supply from the Crombie reservoir, about seven miles distant from the town, either by purchasing the works, which belong to the Dundee Water Commissioners (but are not now required for the supply of Dundee), or by paying for the water at so much per 1000 gallons. At a meeting of the Works Committee of the Dundee Water Commissioners, held last Thursday, the Convener and Engineer were authorized to enter into negotiations with the Arbroath Police Commissioners in reference to the scheme proposed, with instructions to report the result of their conference to the Committee.

At the meeting just referred to the Manager submitted a satisfactory report regarding the quantity of water in store, and mentioned that the Loch of Lintrathen was full, and that the daily average consumption was 4,452,000 gallons. The Provost stated that a suggestion had been made for supplying the bleachers on the Dighty with water from Monilrie, and it was remitted to the Convener and Engineer to meet with the parties and prepare a scheme for the consideration of the Commissioners.

The Rothesay Town Council are seriously considering the propriety of purchasing the works and undertaking of the local Water Company, which was established about seventeen years ago. Originally the works cost £10,000, and last year a dividend of 12 per cent. was paid, while during each of the two previous years it was 10 per cent. Last year's rate to consumers was 8d. per £1 of rental. It is thought that the purchase may now be made for the sum of £25,000; but before deciding on giving that amount, the Council have resolved to submit the matter to a plebiscite of the ratepayers.

Towards the end of the past week the Glasgow pig iron market became a shade firmer; still, over the whole week there was a fall of 4d. per ton, and the market closed on Friday with sellers at 51s. 1d. cash, and 51s. 3d. one month, buyers near.

The coal market, though still very dull, has improved somewhat during the past week.

Mr. Key writes: "In last week's 'Trade Notes from Scotland,' the clause 'lowest maximum was 25.67 candles,' ought to be '27.68.' The lowest minimum was 25.67 candles for this southern station for the week ending Feb. 16, 1878."

**BURNLEY GAS SUPPLY.**—The Burnley Town Council, at their meeting on the 22nd ult., decided to petition the Local Government Board to extend their borrowing powers by £60,000; £20,000 being wanted to complete the sewerage scheme, and £35,000 for gas extensions.

**BISCHOF'S SPONGY IRON FILTERS.**—The Sub-Committee of the Sanitary Institute, appointed to test the filters exhibited at Leamington, in October last, during the Congress, have recommended that the medal of the Institute, for general excellence be awarded to Bischof's spongy iron filters.

**QUALITY OF THE BIRMINGHAM GAS.**—Mr. Jackson reports that, during the month of February, at the four gas-making stations of the Corporation, he made 16 examinations of the illuminating power of the gas supplied to the borough. The maximum light in sperm candles was 18.10; minimum, 16.94; average, 17.39. The parliamentary standard is 15 candles with Sugg's No. 1 "London" burner.

**HAMBURG GAS-WORKS.**—The works of the Hamburg Gas Company at Hamburg have recently been covered with a gigantic iron roof, constructed by the "Eisener Union." Its weight is 51,500 kilogrammes, its length 84 metres. With the exception of the roof on the Liverpool Gas-Works, it is the largest gas-works roof in Europe.

**ELECTRICITY IN WAR.**—The German War Department have recently carried out some experiments on a large scale with the electric light at Metz, in order to test its practicability for military purposes. One of the largest known electric lanterns was used for trials, and it was found possible to distinguish small detachments out of rifle-shot with sufficient accuracy to direct on them artillery fire.—*Nature*.

**KIRBY MOORSIDE WATER SUPPLY.**—This question is at present agitating the minds of the ratepayers. Two rival schemes have been brought before them—one for the existing Gas and Water Company to furnish a supply from the Harland Spring, and another for the Sanitary Authority to provide a supply at the cost of the rates. A public meeting, held in the Toll Booth, under the presidency of Mr. Featherstone, decided that the Sanitary Authority should provide a supply of water from the Harland Spring, by accepting the terms of the Gas and Water Company.—*Leeds Mercury*.

**REDUCTIONS IN THE PRICE OF GAS.**—At a meeting of the Ramsgate Local Board on the 21st ult., it was resolved that, after the expiration of the current quarter, the price of gas shall be reduced to 3s. 9d. The Wolverhampton Company announce a reduction from 2s. 9d. to 2s. 7d., as and from the 1st of April. The Ossett Gas Company have resolved to reduce the price of Gas in Ossett and Horbury 5d. per 1000 cubic feet, the reduction to commence on and after the 1st of July next, when the price will be 3s. 9d., with the usual allowances. At Barnsley, a reduction of 3d. took place on the 1st of January, and at Narborough a reduction of 3d.

**HARROGATE GAS COMPANY.**—A sale of 400 new shares—maximum dividend, 7½ per cent.—in this Company took place on Saturday, the 23rd ult., under the auction clauses of their Act passed in 1863. There was, as usual, a good attendance of buyers, and the shares realized from £5 14s. to £5 16s. per share premium. The nominal amount of the shares is £10, and the whole will be called up in about twelve months. The various issues of this stock have been as under:—

1864 . . . . .	£9000 . . . . .	Premium, 11s. 6d. per £10 share.
1869 . . . . .	4500 . . . . .	" 47s. 0d. "
1871 . . . . .	4500 . . . . .	" 61s. 6d. "
1876 . . . . .	5000 . . . . .	" 101s. 6d. "
1878 . . . . .	4000 . . . . .	" 115s. 0d. "

The Company have for the last ten years paid maximum dividends of 10 per cent. on original, and 7½ per cent. on new stock.

**SCOTCH ROADS AND BRIDGES BILL.**—On Friday, the 22nd ult., the Lord Advocate received an influential deputation from Edinburgh and Leith on the subject of the Government Bill for dealing with the roads and bridges in Scotland. There were representatives from the Edinburgh and District Corporation Water Trust, the Edinburgh Gas Company, and the Edinburgh and Leith Gas Company. They asked that a clause might be inserted in the Bill by which the reservoirs and underground property situated in the counties, and belonging to the various bodies named, should not be rated at their full annual value for the purposes contemplated by the measure. During a long consultation with his lordship the various speakers put forward a strong plea in favour of making the rating considerably less than full value. The Lord Advocate, however, gave them no encouragement to expect that he would accede to their wishes, and stated that, if exemptions were once admitted, there would be no end to them; and he suggested instead that the matter under consideration was one which would be better dealt with by an alteration of the Valuation Bill. The deputation subsequently saw both the Members for the city of Edinburgh in the lobby of the House of Commons, and they asked Mr. McLaren to put a clause on the paper to meet their views. The honourable gentleman accordingly drafted a clause, which, if adopted, will have the effect of putting reservoirs and gas-works, together with water and gas-pipes, in the same position as agricultural land in burghs. This, it may be explained, practically means an assessment at the rate of a fourth of the annual value. There were included in the deputation Lord Provost Boyd, Bailie Colston, Treasurer Wilson, and Mr. Skinner (Town Clerk), as the representatives of the Corporation and Water Trust; ex-Provost Watt, Mr. Stuart Neilson, W.S., Mr. Watson, Manager, Mr. Reid, Manager, and Mr. Duncan, Law Agent, as representing the Edinburgh and Edinburgh and Leith Gas Companies, and other gentlemen.

### Register of New Patents.

#### APPLICATIONS FOR LETTERS PATENT.

- 573.—SIMON, H., Manchester, "Improvements in apparatus for raising or propelling water and other liquids." A communication. Feb. 12, 1878.
- 581.—PUNSHON, R., Brighton, Sussex, "The treatment of sewage and filtration of water." Feb. 12, 1878.
- 595.—HADDAN, H. J., Strand, London, "Improvements in stop-cocks." A communication. Feb. 13, 1878.
- 613.—PEARSON, H. J., Beeston, Nottingham, "Improvements in valves." Feb. 14, 1878.
- 615.—TAYLOR, A. E., Islington, London, "A new or improved pipe and column cutter." Feb. 14, 1878.
- 633.—PORTEOUS, A. N., Edinburgh, "Improvements in the production of hot-air gas, and in the use of the same for motive purposes and for illumination." Feb. 15, 1878.
- 640.—LYON, H., Manchester, "Improvements in the construction of washers and scrubbers for purifying gases." Feb. 15, 1878.
- 643.—PITT, S., Sutton, Surrey, "Improvements in the separation of vapours or volatile bodies from gases or other vapours with which they may be admixed." A communication. Feb. 15, 1878.
- 670.—SKINNER, H. E., Borough, London, "New or improved arrangements for pumps and exhausters." Feb. 18, 1878.
- 700.—SIEMENS, C. W., Westminster, "Improvements in regenerative gas furnaces or kilns and gas producers." Feb. 20, 1878.
- 723.—WEBSTER, G. E., Nottingham, "Improvements in observation photometers for registering the comparative consumption of gas-jets, and the light given by the same; meters for measuring the consumption of gas as supplied by gas-works, which also act as governors, and may be applied as such, singly, or as meter and governor, combined or single; burners constructed to burn with a steady light at a low pressure, and sensitive to pressure at which they are not suitable by an alteration in the shape of the flame; shades for billiard-tables, &c., globes, triangles or galleries for same, smoke tops or coronas." Feb. 21, 1878.
- 729.—WILSON, W. P., New Cross, London, "Improvements in the method and in apparatus used in the purification of gas, parts of which apparatus are also applicable to the carburetted or measuring of gas or atmospheric air." Feb. 21, 1878.

#### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 3131.—BEAUREGARD, F. A. T. DE, Paris, "Improvements in the mode of utilizing directly vapours or gas as motive power." Aug. 16, 1877.
- 3134.—BORRADAILE, T. S., Old Broad Street, London, "Improvements in the construction of apparatus for regulating the consumption of gas." A communication. Aug. 17, 1877.
- 3143.—THOMPSON, W. P., Liverpool, "Improvements in and appertaining to ball or spherical valves." A communication. Aug. 18, 1877.
- 3151.—FROST, J., Huddersfield, Yorks, "Improvements in treating the residuum or precipitate obtained in the purification of sewage." Aug. 18, 1877.
- 3159.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in effecting the conversion of hydrocarbons and other combustible liquids into gas, and in apparatus or means employed therein, and in or for the production and application of gaseous mixtures." A communication. Aug. 20, 1877.
- 3166.—ALLAN, W., Kilbirnie, N.B., "Improvements in and connected with mine and other pumps." A communication. Aug. 20, 1877.
- 3248.—GERSON, C., Hamburg, Germany, "An improved system of filtration and apparatus connected therewith." Aug. 27, 1877.
- 3307.—HADFIELD, R., Sheffield, "Improvements in gas checks." Aug. 30, 1877.



## Share List of Metropolitan Gas and Water Companies.

(Corrected by Mr. F. N. GOLDING, Sun Court, Cornhill, from the latest Stock Exchange Quotations.)

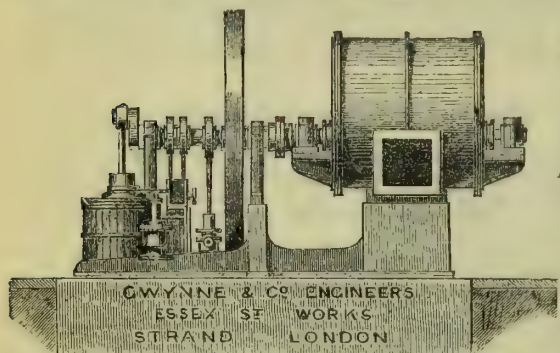
Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent. p. Ann.	Latest Quotations.
10000	£	GAS COMPANIES.	£ s. d.	£ s. d.	£	56000	50	GAS COMPANIES.	£ s. d.	£ s. d.	£	1500	10	GAS COMPANIES.	£ s. d.	£ s. d.	£
5000	20	Anglo-Romano . .	20 0 0	9 0 0	20-25	9000	5	Impr. Continental	45 15 0	57 p.sh.	91-93	1500	10	H andsw. & Putney	10 0 0	10 0 0	19-20
1000	20	Bahia (Limited) . .	20 0 0	3 0 0	10-11	3830000	Sk.	Limerick Gas . . .	5 0 0	2 10 0	3-3½	1500	10	Do. . . . .	10 0 0	7 10 0	11-12
1500	20	Do., do., redeem.	20 0 0	10 0 0	..	1500000	Sk.	Do., 1st pref. . . .	100 0 0	10 0 0	194-198	2957	10	Do. . . . .	10 0 0	7 0 0	..
40000	5	Bombay (Limited) . .	5 0 0	7 10 0	7-7½	14450	Sk.	Do., 2nd pref. . . .	100 0 0	6 0 0	135-140	993	10	Do. . . . .	10 0 0	7 0 0	..
10000	5	Do., fourth issue . .	4 0 0	7 0 0	5-5½	4350	Sk.	Do., 3rd pref. . . .	100 0 0	6 0 0	120-130	26000	5	Do. . . . .	3 0 0	7 0 0	..
14000	20	British (Limited) . .	20 0 0	10 0 0	38-40	7622	25	Do., A shares . . .	25 0 0	6 0 0	32-34			West Ham . . . .	5 0 0	10 0 0	8-9
7500	20	Cagliari (Limited) . .	20 0 0	5 0 0	15-16	268057	All	Do., Debent. stk. . .	100 0 0	57. & 67.	..						
550000	Sk.	Commercial . . . .	100 0 0	10 0 0	194-198	15000	5	Malta and Mediter- anean (Limited) . .	5 0 0	2 0 0	2-2½						
70000	100	Do., 7 per cent. . .	100 0 0	6 0 0	139-141	6000	5	Do., preference . . .	5 0 0	7 10 0	5-5½						
20000	20	Continental Union . .	20 0 0	6 0 0	19-20	29000	5	Mauritius (Limited) .	2 5 0	2 10 0	4-1						
20000	20	Do., new . . . . .	20 0 0	6 0 0	19-20	25000	20	Monte Video (Lim.) .	20 0 0	8 0 0	17½-18						
10000	20	Do., preference . . .	20 0 0	7 0 0	23-25	8000	10	Nietheroy, Brazil (Limited) . . . . .	10 0 0	5 0 0	..						
75000	Sk.	Crystal Palace Dis- trict . . . . .	100 0 0	10 0 0	195-200	30000	5	Oriental (Calcutta) .	5 0 0	9 10 0	7-7½	12000	100	Chelsea . . . . .	100 0 0	6 0 0	150-155
125000	Sk.	Do., 7 per cent. . .	100 0 0	7 0 0	138-142	30000	5	Do., new shares . . .	3 0 0	9 10 0	11-13	1800000	100	East London . . .	100 0 0	6 0 0	152-157
50000	Sk.	Do., preference . . .	100 0 0	6 0 0	125-135	10000	5	Ottoman (Limited) . .	5 0 0	3 0 0	2-3	8000	50	Grand Junction . .	50 0 0	5 0 0	81-83
23406	10	European (Limited) . .	10 0 0	10 0 0	17-18	27000	20	Pará (Limited) . . .	10 0 0	2 0 0	43-51	5840	25	Do., 4 shares . . .	25 0 0	5 0 0	40½-41½
12000	10	Do., new shares . . .	7 10 0	10 0 0	6-7 p.	3600000	100	Phœnix . . . . .	20 0 0	10 0 0	38-40	2160	25	Do., new ditto; max. div. 7½ p.c.	25 0 0	5 0 0	33-34
35406	10	Do., new shares . . .	5 0 0	10 0 0	34-4	1440000	Sk.	Do., new max. 7½ . .	60 0 0	7 10 0	105-112	547960	100	Kent . . . . .	100 0 0	8 0 0	202-207
1094840	Sk.	Gaslight & Coke A. .	100 0 0	10 0 0	189-92xd	37500	20	Do., capitalized . . .	100 0 0	5 0 0	103-106	970	100	Lambeth . . . . .	100 0 0	6 0 0	150-154
1000000	Sk.	Do. B. . . . .	100 0 0	4 0 0	78-82xd	7359	5	Do., new, 1876 . . .	20 0 0	10 0 0	29-31	1161	100	Do., max. 7½ p.c.	100 0 0	6 0 0	150-154
50000	10	Do. 5 per cent. pref. conv., 4th issue . .	10 0 0	5 0 0	0 17½-18½	2000	5	Rio de Janeiro (L.) .	5 0 0	7 10 0	51-53	4475	100	New River . . . .	100 0 0	7 0 0	320-350
50000	10	Do. do., 5th do. . .	4 0 0	5 0 0	0 6½-7½pm	1500	32½	Singapore (Limited) .	5 0 0	7 10 0	51-61	400000	100	Do., deb. sk. 4 p.c.	100 0 0	7 0 0	280-300
2000000	Sk.	Do. C 10 p.c. pref. .	100 0 0	10 0 0	0 205-10xd	4000	50	Do., preference . . .	5 0 0	7 10 0	51-53	3036	100	Southwark & Vauxh.	100 0 0	2 0 0	103-105
3000000	"	Do. D do. do. . . .	100 0 0	10 0 0	0 205-10xd	20000	12½	Shanghai . . . . .	32 10 0	12 0 0	30-32	1296	100	Do., pref. stock . .	100 0 0	5 0 0	100-103
1650000	"	Do. E do. do. . . .	100 0 0	10 0 0	0 205-10xd	15000	10	South Metropolitan .	50 0 0	11 0 0	108-111		100	Do., D shares . . .	100 0 0	4 0 0	98-100
300000	"	Do. F 5 do. do. . . .	100 0 0	10 0 0	0 101-1xd.			Do. . . . .	12 10 0	10 0 0	25-27		100	Do., new ordinary . .	40 0 0	4 10 0	..
600000	"	Do. G 7½ do. do. . .	100 0 0	7 10 0	0 140-50xd			Do., new shares . . .	10 10 0	10 0 0	13½-14½		100	Do., new ord. No. 1	40 0 0	4 10 0	..
1300000	"	Do. H . . . . .	100 0 0	7 0 0	0 139-41xd								100	Do., new ord. No. 2	40 0 0	4 10 0	..
6200	5	Georgetown, Guiana .	5 0 0	5 0 0	..	15000	10	Swray Consumers . .	8 0 0	10 0 0	15-20	1600	100	West Middlesex . .	61 0 0	67 p.sh.	140-143
5000	10	Hong Kong (Lim.) . .	10 0 0	10 0 0	18-20	10000	10	Do., new . . . . .	8 0 0	10 0 0	7½-8½	12172	61				

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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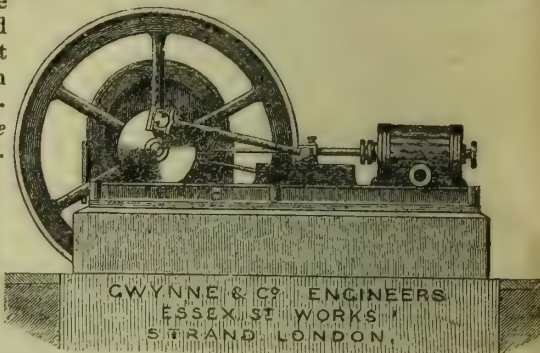
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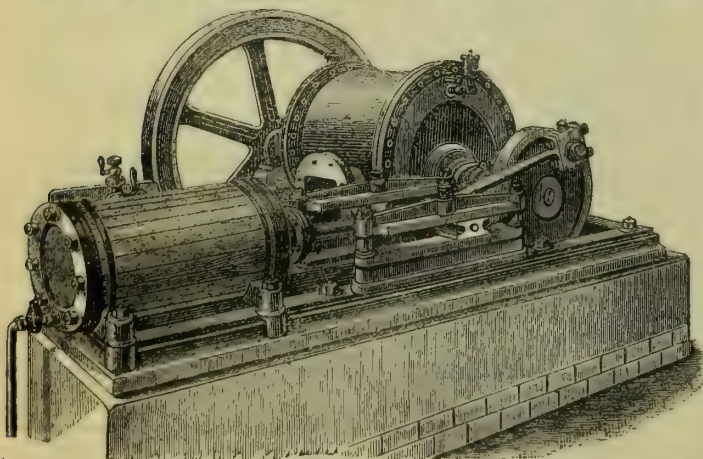
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TO CORRESPONDENTS.

- G. H. S.—1. If the resolution in reference to the Directors remuneration was a general one, and not intended to apply to one year only, it will not require to be repeated. A fresh resolution will be necessary whenever an alteration in the amount is made. 2. It is optional with the Company which meeting shall be considered the annual meeting.
- J. H. B.—Your suggestions are always welcome. The papers and discussions to which you allude will find a place in our columns as opportunity serves. One of them, indeed, is already in type.
- R. A. G.—In the matter of supply you are controlled by no Act of Parliament whatever. You can do just what you like, but must put up with the consequences if you do not please your customers.

THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 12, 1878.

Circular to Gas Companies.

THE Shylocks of the Metropolitan Board are determined to have their pound of flesh—that is, if they can get it. It seems that a letter from the Board of Trade asked the opinion of the Metropolitan Board on a proposed alteration of the penalty clauses in the Acts of the Chartered, South Metropolitan, and Commercial

Gas Companies. As these Companies have no Bills before Parliament, we presume reference is made to the penalty clause in the Gas-Works Clauses Amendment Bill. When this Bill becomes law, it will, no doubt, like the Act of 1871, be held to apply to all Gas Companies, past, present, and future. Thus, clause 40 of the amended Bill becomes of some importance to the Companies named above. In their special Acts, the forfeitures are fixed and unalterable amounts. Nothing is left to the discretion of the Magistrate. He is simply to make an order for payment, or to issue a warrant of distress for a specific sum. The amended Bill proposes to alter this state of things, by inserting the words, “not exceeding” before the maximum penalty is named. These words will be found in the penal clauses of every special Gas Act, except those of the Companies above mentioned. How they got left out of these we do not understand. No doubt one reason why the Shylocks are so serious in the matter is that, under the new Act, fines imposed at the instance of the Board will be paid to the Board, and not to the police-fund as formerly. As to the propriety of conferring discretionary power on a Magistrate, no one but a member of the Metropolitan Board can doubt. There are degrees of criminality which it would be unjust to visit with the same punishment. Even when the Chief Gas Examiner has refused to certify that a default was occasioned by unavoidable cause or accident, there may remain much to be said on behalf of the Company. The defect complained of may have been temporary, and may have been very small. This, and a good deal more, might be urged in favour of the Company, and might induce a Magistrate to mitigate the penalty. We do not suppose that the Board of Trade will pay much attention to the remonstrance from Spring Gardens, and Parliament is not likely to pay any at all, so we have no doubt the clause will pass as it stands.

The Parliamentary Committees are disposing of the Gas Bills before them rather rapidly. In the House of Lords, the preamble of the Exeter Gas Bill was declared proved; but some alterations were made in clauses. The amount of new capital granted is only £100,000, with the usual borrowing powers, and it was stipulated that the whole of the new capital should not be thrown on the market at the same time. We rather think that some opposition will be raised before the Commons Committee, on account of the standard price granted.

In the House of Commons, the Bill of the Bangor Water and Gas Company was withdrawn, and an agreement was arrived at between the Company and the Local Board, in virtue of which the latter will eventually become possessors of the undertakings. The consideration to be paid is perpetual annuities, equal to maximum dividends, redeemable at twenty-five years purchase. With regard to minor details, the Company and Board are not in accord. It is understood that the Company will oppose the Bill of the Local Board in the House of Lords, in order to get some clauses amended.

The Brading Harbour (Isle of Wight) District Gas Bill was, last week, passed by the Chairman of Ways and Means as an unopposed measure.

The Local Board of Torquay have thought better of it; and, the Gas Company having agreed to give fifteen-candle gas at the standard price of 3s. 6d. per thousand, the opposition of the Local Board to the Company's Bill has been withdrawn. The ratepayers of Torquay are thus saved the cost of an expensive parliamentary contest, from which they could have gained little or no advantage.

As we anticipated, the opposition of the Corporation of York to the Bill of the Gas Company has practically collapsed; and the Bill, as slightly modified, will now go forward unopposed. It seems certain that for once the ratepayers and the gas consumers of a city have been on the side of the Gas Company, and had not the smallest desire to see the undertaking in the hands of their Corporation. No doubt further efforts will be made by the Town Council with a view to effect a purchase, but they are not likely to prove successful at present. The ratepayers of York may be congratulated on being spared the expense of a contest which would have left its mark on the rate-books.

Since writing the above, we have had before us the report of the adjourned meeting of the York Town Council, on Friday last, when a rather stormy discussion took place on a motion brought forward by Mr. Leeman, M.P., pledging the Council to proceed in their opposition to the Gas Company's Bill. The negotiations between the Town Council and the Gas Company, which once looked hopeful, were broken off in consequence of the Council demanding sixteen-candle gas, auction clauses, and a sliding scale with a standard price of 3s. 6d. per thousand. This is what the Company could not possibly concede, and, therefore, all further treaty was broken off. When Mr. Leeman's resolution was put to the meeting, fifteen members voted for it, and fourteen against it. The division not showing an absolute



majority of the whole Council, as required by the Municipal Corporations (Borough Funds) Act, the Mayor declared the resolution lost. What the next dodge of the would-be confiscators will be we do not know. Probably we shall not hear any more of them for some time.

Sir Henry Hunt, as Umpire, has made his award in the case of the purchase of the Stafford Gas Company by the Corporation of that city. The Company asked £76,000, and the Umpire has awarded them £70,000, with costs, which will amount to about £1000. The Corporation, of course, take the bonded debt of the Company.

The report of the Gas Committee of the Corporation of Birmingham, which will be found in another column, shows that the gas undertaking has been very profitable during the past year. The net profit applicable to public purposes amounts to no less a sum than £36,684. The proper application of this sum would be in the reduction of price; but to this suggestion we may expect a majority of the Town Council would not listen. A species of vanity makes them proud of handing over large sums of money for improvement purposes, while consumers loudly complain of the unnecessarily high price of gas. Whatever Birmingham may have gained by the transfer, the gas consumers can hardly have been said to have benefited by the change of proprietorship. Birmingham is desirous of imitating Manchester, by doing a great deal with the gas profits. At the rate they are now accruing, these profits may in time be made to pay the cost of the new Boulevard, and thus the improvement will have been effected at the expense of the gas consumers, which shows that these are doubly rated. We feel satisfied that public opinion will, in time, awake to the truth that corporation gas profits ought only to be applied in the reduction of price. The specious argument that, as the ratepayers as a body are responsible for the undertaking, all ratepayers should participate in the profits, is worth nothing. There is no risk in the concern, which must go on increasing in value every year.

The West Bromwich Improvement Commissioners, we notice, are about to apply to the Corporation of Birmingham to reduce the price charged them for gas, until, we presume, they get their own works ready. They point out, as indeed was mentioned in the Birmingham Council, that the cost of coal is now just what it was before the famine, when the Gas Companies charged 2s. 9d. per thousand feet, and it is argued that the Corporation might sell at the same price now.

We learn that the terms arranged between the Stratford-on-Avon Gas Company and the Corporation are twenty-five years purchase of maximum dividends, with three years salaries as compensation for Directors and other officials. All parties seem well satisfied with the arrangement.

We cannot understand why gas should be so dear at some places. There is Woodhouse, for example, near Sheffield, where consumers are now charged 5s. per thousand feet. We read that the Sheffield United Company have offered to sell gas in bulk to the Woodhouse Company, which will enable the latter to make a considerable reduction in price.

The Hereford Gas Management Committee recently made a report to the Council, in which they recommended proceeding on a penny-wise and pound-foolish system, that the existing works should be patched and added to, rather than do at once what must be done in the course of a few years—viz., build new works on a new site. Their recommendation, however, found no favour in the Town Council, and a proposal to instruct the Gas Committee to take immediate steps to look out for a new site was carried by a majority of fifteen to seven. The Hereford gas undertaking is managed on fair principles. The Corporation do not make large profits, but they pay their way and have a comfortable balance in hand. Their business progresses at a very satisfactory rate, and they will certainly find it to their advantage to have their new works completed with all possible speed.

We may continue our reports on provincial meetings with the stereotyped remark that they show a well-sustained state of prosperity. The Hastings Company held their meeting last week, and declared full dividends out of current profits. The report is not so favourable as some which have preceded it, and the Directors allege that "the general rise in the labour market" has had considerable effect on the expenses of manufacture, and "consequently tells on the finances of the Company." However this may be, we find the public at Hastings very much discontented with gas at 4s. 5d. per thousand feet. The Directors have promised to reduce the price as soon as they possibly can, and we have no doubt they will do so—that is, if they can pay maximum dividends at the same time. The Company, however, it must be confessed, are badly circumstanced with regard to the supply of coal. Last half year they paid for their prime material £3624. Freight, railway carriage, cartage

to works, and trimming cost nearly as much as the coal—viz., £3287, and, in addition, the Company paid dues to the Local Board amounting to £763, which is over twenty per cent. of the original cost of the coal. Thus heavily weighted with charges, it is not surprising that the Company are compelled to keep up a high price for gas.

The Dover Gas Company held their half-yearly meeting this day week. The meeting is memorable as the first held since the contract with their former lessees was terminated. Under the personal conduct of the Directors, the Company continue to make progress. More gas is manufactured and sold; and the price is reduced, which opens up a prospect of still further additions to the sale. The confidence of the public in the undertaking is shown by the price paid for shares which are put up by auction. At a recent sale of new issues, the £10 shares fetched £15 6s. 6d., and, when it is remembered that the maximum dividend is only seven per cent. on the nominal amount of shares, the sum offered looks to us extravagant. The Directors have been able to accumulate upwards of £7000 in the shape of depreciation and other funds. This, the Chairman remarks, is nearly as much as their statutory powers will allow them to invest, and thus gas is likely soon to become cheaper in Dover. We ought to add that the Chairman paid a graceful compliment to the late lessees and present Manager, without whose able assistance and advice the Company would not now be in such a prosperous condition.

The Chesterfield Water and Gas Company held their half-yearly meeting last week, when maximum dividends were declared on all classes of shares and stock, with a bonus of twenty per cent. on the original shares for arrears of dividend. Considerable discontent is expressed at the high price of gas in Chesterfield—viz., 4s. per thousand feet; but, as in all cases where gas and water undertakings are conjoined, the greater part, sometimes, indeed, the whole, of the profit has to be obtained from the gas consumers. The arrangement is not altogether fair to the consumers, but it is inevitable. The Company are in a highly prosperous state, and we should think that some reduction in price would soon be possible.

The Blackburn Gas Company, during the past year, have been carrying on their undertaking as Trustees for the Corporation, and we publish in to-day's number what will, we presume, be their last balance-sheet, together with a lucid statement of the working results by their Engineer, Mr. S. R. Ogden. These show that the Company hand over the undertaking in a highly prosperous condition. The working results are eminently satisfactory. The make is good, and the unaccounted-for gas cannot be regarded as excessive in amount. The works are now absolutely transferred to the Corporation, who, fortunately for them, retain the services of Mr. Ogden as their Manager. It seems that some little expense will have to be incurred for renewals, but in all other respects they are handed over in perfect working order.

A number of small Companies have held their meetings with the usual results. The Tenterden Company pay seven per cent., and have a balance, with which they pay off a mortgage debt. The price of gas will be reduced on the 1st of April. The Nasborough (Leicester) Gas Company, Limited, pay five per cent., and add one per cent. to their reserve-fund. They also propose to reduce the price of gas five pence per thousand after March 31st. The Ripley Gas Company pay a dividend of 9s. 3d. per share. In consequence of the badness of trade, the revenue declined a little during the past year. The Belper Gas Company declare a full dividend. This Company have recently sold some shares by auction which seem to have brought a premium of nearly one hundred per cent. The final half-yearly meeting of the Longton Gas Company was held on the 25th ult., when full dividends were declared, leaving a considerable balance. The undertaking passes immediately into the hands of the Corporation, who have secured an excellent bargain. The Morecambe Gas Company appear to be a flourishing concern. They pay ten per cent., and are now about to raise £4000 new capital to extend their business. The Douglas (Isle of Man) Gas Company pay ten per cent., and carry forward a good balance. They seem to treat their customers with liberality, and the Chairman mentioned that in the course of three years they had reduced the price of gas 1s. per thousand feet. Most undoubtedly the Company should have an insurance fund of their own, and should regularly set apart a portion of their profits for the purpose. The Richmond (Surrey) Gas Company pay full dividends, add to the reserve-fund, and carry forward a good balance. This well-managed Company are certain to continue to prosper.

*Audi alteram partem* is advice we never neglect; and, therefore, as we are assured that the Gas Committee of the Corporation of Wigan have a good defence against the accusations brought against them, we shall make no further remarks on the case until we see the statement of the Committee. If they can



show that they have published their accounts in accordance with statutory requirements, and have in no instance neglected to distribute copies of them as the law directs, we shall be very glad. The Committee ought, however, to make their defence with the least possible delay.

We willingly give insertion to the temperate communication of Mr. R. P. Spice on the affairs of the British Association of Gas Managers. As we are assured the Committee have the matter under serious consideration, we think it may, without further discussion, be left to them to frame a scheme to place before the full body of members at the next annual meeting.

### Water and Sanitary Notes.

BEFORE these lines meet the eyes of most of our readers, the Water Purchase Bill of the Metropolitan Board of Works will have been relegated to a Committee or summarily rejected. It is, therefore, only to preserve the continuity of history that we here record the visit to Mr. Slater-Booth of a deputation from several of the Metropolitan Vestries, praying the Government to interfere to stop the progress of the Bill. The deputation was of an influential character, and was introduced by the new Recorder of the Corporation of London. We are bound to say they obtained small comfort from the President of the Local Government Board, who, if correctly reported, distinctly intimated that a Select Committee was the only body before whom the question could be thoroughly discussed. Thus it seems probable that we shall have a Committee sitting for two months, at an enormous expense—it may be £2000 per day, or even more. The Members of the Metropolitan Board do not care what they spend in parliamentary contests, and they pay no heed to public opinion. In one respect the Water Companies may look on the struggle with complacency. If they are successful in defending their interests before the Committee, the water consumers will have to pay the costs. If the Committee pass the preamble of the Board's Bill, the costs on both sides will have to be paid by the Board—that is to say, by the Metropolitan Ratepayers. It is too late now to argue further, and we shall not speculate on the result of to-night's division. If it could be shown that the inhabitants of the Metropolis were likely to be benefited in a single degree, we should not oppose the purchase of the Companies by the Board; but we know very well what will happen. Water, just such as is now supplied, will be distributed in restricted quantities. The domestic rates will remain just what they are now, and a public rate will be added. Vexatious restrictions will be imposed on every hand, and the visits of the Board's Inspectors will be frequent events in every household. The inhabitants of the Metropolis will soon get tired of all this; but if the Board succeed, the ratepayers must pay for the apathy they have shown on the question.

The Select Committee who have Mr. A. H. Brown's Public Health Bill under consideration are making progress, and will probably report the measure this week. The Bill we believe to be utterly Utopian. That much is desirable in the amendment of the water supply of our rural populations is undeniable; but the question whether matters can be at all improved by this Bill, except at such a cost as must drive landlords and tenants alike across the Atlantic, or elsewhere, to avoid the overwhelming weight of taxation, is one that is well worth considering. It is all very fine to put down upon paper a clause to the effect that every house must have a supply of pure water within a reasonable distance, but it is another thing to find a supply. Besides, what is a reasonable distance? We know a place in England where a string of children can be seen from morning to evening with pitchers and pails, fetching water from a spring a mile distant from their homes. A mile can hardly be considered a reasonable distance, but yet we believe that potable water is not to be found in the district at a less range. And then, the rights of the free-born Briton are to be so seriously interfered with. He may not build a house where he pleases, unless his Local Board are satisfied that his water supply is good and sufficient; and if he should pull down his house he may be prevented from rebuilding it. Of course, the Committee on this Bill were treated to all the usual nonsense about the dangers of shallow wells, and they were once again taken to Switzerland to be shown that filtration will not remove the poison of typhoid. That landlords do not always choose the best sites for wells may be conceded; they select those which they consider will be most convenient to their tenants, who like to have water near home—indoors, if they possibly can. However, it is very gratifying to be told by Mr. Rawlinson, C.B., that official inspection is capable of curing all the evils under which we labour; but it will not reduce taxation.

The Thirlmere scheme of the Manchester Corporation is now before a Select Committee, and the two most important witnesses for the Corporation—Sir Joseph Heron and Mr. Bateman—have been heard. It will, we think, be admitted that a good case has been made out for Manchester. It is certain that, in the course of comparatively few years, a large additional supply will be necessary for the City and its surroundings; and, according to Mr. Bateman, there is no water nearer than Thirlmere obtainable in sufficient quantity. We are somewhat surprised at the small interference with private property which the scheme will entail; so that the opposition of landed proprietors cannot be expected to be severe. More serious, to our minds, are the fifteen miles of coalfields which the aqueduct will have to traverse, and which Mr. Bateman tried in vain to dodge. A sinking of the ground would, of course, be fatal to the stability of the aqueduct, and Manchester might some day find itself suddenly deprived of the Thirlmere supply. The danger, however, is very remote. In our opinion, Mr. Bateman showed conclusively that the appearance of Thirlmere would be greatly improved if the Manchester scheme were carried out. We must wait to learn what the Thirlmereites will have to say in opposition, but we feel satisfied that mere sentimental considerations will not influence a Committee of the House of Commons.

The Derby Water-Works Company held their half-yearly meeting on the 27th ult. Making a small draw on the reserve-fund, the Directors were able to declare a dividend of eight per cent. on the original capital and full rates on all other descriptions. The business of the Company increases rapidly. Their new works are now in operation, and the higher parts of the town are satisfactorily supplied.

PRESENTATION TO MR. JOHN CHESTER, OF PICKERING.—On Saturday, the 2nd inst., Mr. Chester, the resident Manager of the Pickering Gas and Water Company, was presented with a testimonial from the inhabitants and gas consumers of the town, as a token of their esteem and confidence in him. The testimonial was raised by voluntary subscription, and took the form of an English silver lever watch, which bears the following inscription:—"Presented to John Chester, as a token of the esteem and confidence the inhabitants of Pickering have in him as Manager and Collector to the Pickering Gas and Water Company. March 2nd, 1878." Mr. Chester, in a few words, thanked the subscribers for their kind present.

REDUCTIONS IN THE PRICE OF GAS.—The Directors of the Borough of Tynemouth Gas Company recommend to their Shareholders a reduction of 3d. per 1000 feet in the price, which, with the scale of discount fixed by Act of Parliament, makes the net prices 3s. 1d., 3s., and 2s. 11d. respectively, according to the quantity consumed within the lighted district, as defined in the Act; and also a similar reduction of 3d. per 1000 feet outside the borough. The Newmarket Gas Company will reduce the price of gas, on and after the 6th day of April next, from 5s. 10d. to 5s. per 1000 feet. The Ferndale Gas Company announce a reduction from 6s. 8d. to 6s., as from the commencement of the April quarter.

DOUGLAS (ISLE OF MAN) GAS COMPANY.—The 86th half-yearly general meeting of Shareholders was held on the 25th ult.—Mr. G. W. Dumbell, M.H.K., in the chair. The Secretary (Mr. J. Quinney) read the report of the Directors and the balance-sheet. The report showed a decrease in the profits, as compared with the corresponding half year of 1876, of £85 5s. 2½d., consequent on the reduction in the price of gas from the 1st of October last. It also stated that there was a marked increase in the consumption of gas throughout the town, through the Company being able to deliver it at a more uniform pressure, and also through the addition of the large new burning district of Victoria Street and Loch Parade. The Directors recommended a dividend of 25s. per share, payable on the 4th inst. The Chairman said the Shareholders had reason to be obliged to the Directors for the measures they had adopted for securing the property necessary for the extension of the works, and for the prompt manner in which they had set to work to carry the improvements out; for if the Company were not able to supply the public, some one else would do so. He moved that the report and accounts be adopted and passed. Mr. P. Killey seconded the motion, at the same time making inquiry as to the insurance of the building. Dr. Okell, in reply, stated that 99 out of every 100 Insurance Companies refused to insure Gas Companies. It was a matter of great importance, and the Directors had already taken and were prepared further to take it into full consideration. The Chairman suggested the establishment of an insurance account, mentioning several Companies who never insured, but had their own insurance account, and adding that his own experience, gained when he was owner of a number of vessels, was that by underwriting himself he saved a large amount of money. The report was then put and carried, and thanks were voted to the Directors for their services. Dr. Okell, in acknowledging the vote, said the Directors were doing, and had done, their best for the interest of the Company. But there were two interests the Directors had to consider—first, that of themselves; and, secondly, that of the public. He might say it was the Directors' intention to consider the interests of the public so far as they could, and they would be glad to make a further reduction in the price of gas if possible; but, at present, the great expense they were under for extensions would not allow them to do so. He added that in 1875 they had reduced the price 6d. per 1000; in 1876, 3d.; and last year, 9d., making a total reduction of 1s. per 1000 in the three years. The Chairman hoped they would not lower the price of gas, unless they could keep it at their last and lowest price, as nothing acted more like a blister on the public than to increase the price after it had been lowered. Mr. Killey proposed a vote of thanks to the Manager, Secretary, and all employed on the works, which was seconded by Mr. Brew, and passed. Mr. Smith, in acknowledging the compliment, said it was satisfactory to find that the officers had the confidence of the Company; he had enjoyed it for the last 14 years, and in endeavouring to do his duty, he hoped to continue to enjoy that confidence. The Secretary also, for himself and the others, thanked the meeting for the expression of their satisfaction. He did his best for the interest of the concern, as the Directors well knew. The meeting closed with votes of thanks to the Auditors and the Chairman.



# A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLX.

PUBLIC LIGHTING (*continued*).

The regulator or governor for controlling the supply of gas to public lamps, or other single jets, is one of those simple and beautiful contrivances, the cost of which is compensated a thousand fold in the saving effected by its employment. Besides the direct great economy of gas resulting from its adoption, there is the concomitant advantage of a superior light, from the well-understood fact that with a minimum of pressure at the point of ignition the gas yields the maximum illuminating power which it is capable of affording.

Like many other useful inventions, the appreciation of its value has been comparatively slow. Ignorance of its merits, however, should no longer be alleged as pertaining to those who have the control of gas supply, and the prejudice of Local Authorities against its introduction would be removed by a little judicious explanation of what can be accomplished by its use. Unlike the system of double taps, which is a delusion, it gives regularity and efficiency to the lighting of a district, and tends to prevent the recurrence of those unseemly disputes that are too apt to arise between the contracting parties. Where the governor is applied, the use of the stop-tap is confined solely to shutting off the supply of gas during the non-lighting hours; the tap is opened to the full extent when the burner is lighted.

Lamp governors are of two kinds—those in which some fluid substance, such as mercury, oil, or glycerine, is used as the sealing medium; and the dry class, dispensing with the liquid, and being furnished with a flexible gas-tight diaphragm.

The dry governor, as applied to the regulation of a number of lights, was invented by Mr. Samuel Crosley in 1825; but the modification of this for the regulation of a single jet, as in the case of lamps, was introduced by Mr. J. B. Paddon in 1858. The mercurial governor, for house purposes, was patented by Mr. Hulett in 1849, and afterwards adapted by him to the regulation of single lights. Oil was applied by Mr. John Leslie in his Volumetric Governor, invented in 1841; and glycerine more recently, by Mons. H. Giroud, in his Rheometer, or flow-measurer.

Sectional views of Mr. Hulett's Mercurial and Dry Governors are exhibited in figs. 24 and 25 respectively. The former consists of an

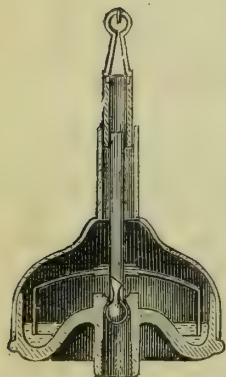


FIG. 24.

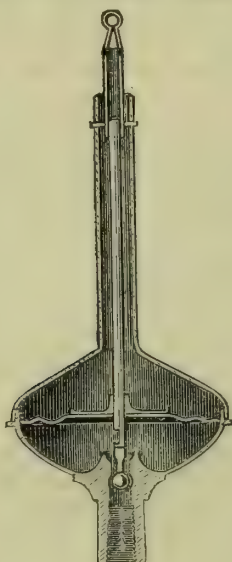


FIG. 25.

outer casing of metal, enclosing within its wider part a bell or gas-holder with its bottom rim sealed in mercury. To the centre of this, on the upper side, a tube is attached; and suspended from it underneath, within the gas passage, is a circular valve. The gas is admitted to the burner through an aperture of fixed size in the crown of the bell. When the pressure which comes upon the under surface of the bell exceeds that to which it is adjusted, the latter rises, carrying with it the outlet-pipe above and the valve below, which partly closes the aperture. Thus the gas way is increased or diminished as the valve falls or rises, and a uniform light is maintained at any pressure. The object of using mercury is, of course, to admit of compactness in the dimensions of the apparatus; the seal required being only 1-14th part the depth of the water-seal, due to the circumstance that the specific gravity of the former is about 14 times greater than that of the latter. The action of the dry governor, fig. 25, is similar to that described, but a flexible diaphragm takes the place of the floating vessel.

Messrs. Clibran's Mercurial Governor, as represented in the accompanying woodcut, fig. 26, is one of the earliest forms of the instrument. The drawing is a sectional elevation of the governor with the burner-tube broken off; *a* is the case; *b*, the valve-seating; a circular cavity communicates by means of two holes with the space left for the valve-spindle, and also with the outlet passage; *f* is a cover, and forms part of the outlet passage; this turns on a hollow screw, *g*, as shown, so as to give access to the floating bell or holder for adjustment by the weights, and is kept in its place by a screw, *i*, the end of which is held in a notch formed in the side of the case. The head of this screw is intended to be covered with sealing

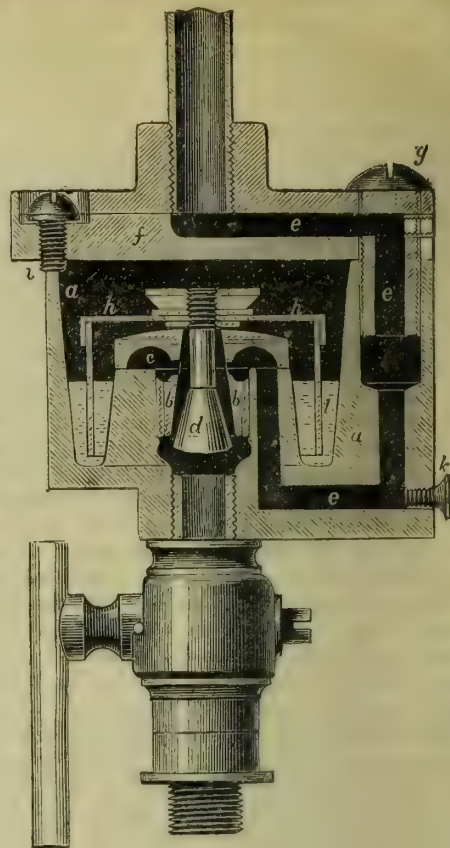


FIG. 26.

wax, and the seal of the Company impressed upon it, in order that the adjustment cannot be tampered with, without breaking the seal; *l*, is the mercury in which the bell floats; and *k* is a small screw with milled head for letting out any water that may collect. By the arrangement described it is impossible for the mercury to get into and stop the gas passage as was the case in some of the earlier forms of regulator.

The Governor of Messrs. Paddon and Ford, of which fig. 27 is an elevation partially in section, differs from all others in having a

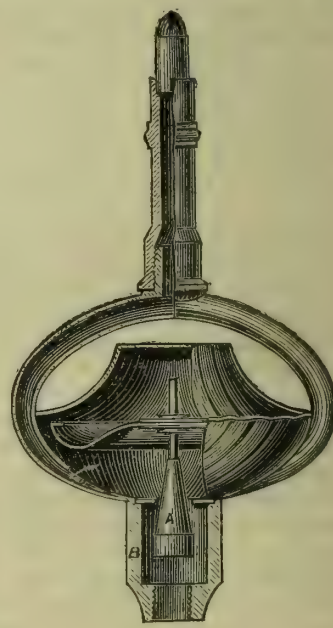


FIG. 27.

magnetized conical steel valve, *A*, of considerable length, working in a soft iron case, *B*. The flexible diaphragm is of more ample dimensions than usual, and the constant attraction exerted by the valve towards the iron tends to keep it in its central position, thus supplying the graduated force required to control the action of the loose diaphragm. A passage for the gas to the burner-tube is provided on both sides of the enclosed chamber, which arrangement also contributes to ensure regularity in the action of the working parts.

(To be continued.)

FAVERSHAM WATER COMPANY.—The annual meeting was held on the 4th ult., when, in accordance with the recommendation of the Directors, a general dividend of 7 per cent., without deduction for income-tax, was declared. The Directors had not supplied the vacancy occasioned by the death of the late Mr. Wm. Murton, and it was resolved that the number of Directors be reduced from nine to eight. It was decided to add £15 to the reserve-fund, and the remuneration of the Directors was fixed at £25 per annum.



# Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

## THE BRITISH ASSOCIATION OF GAS MANAGERS.

SIR,—On reading your article upon the letter which appeared in your JOURNAL of the 26th ult., upon this subject, I at once wrote a few lines, promising to communicate my views on my return from a visit to a provincial town.

In the course of my journey I read the letter, and regretted my promise—first on account of the length, and still more on account of the character of the letter.

But as I feel bound by my promise, notwithstanding the appearance in your last issue of the letter from the President of the Association, which I entirely approve, I now approach the subject, and will endeavour to dispose of it as briefly as possible, and with every desire to avoid giving cause of offence by treading on delicate excrescences.

And, first of all, let me ask is the Association in such a deplorable state of decay that its life is being choked out? The idea, I venture to say, is more sensational than correct; and, so far as my observation goes, I am constrained to say the very opposite is the truth. Considering its age, and the difficulties attending its birth, it is, in my opinion, a fine child. It has grown out of some of its old clothes, and requires new garments. Formerly half a guinea would suffice for an annual rig-out, but now a guinea is required.

But, dropping metaphor, what are the facts? If the income had come in, or, in other words, if some members had not forgotten or neglected to pay their promised subscriptions, the receipts would have been a trifle in excess of the expenditure. And who is to blame but those members who fail or neglect to pay? All are requested to pay, and those who neglect are reminded over and over again.

The question, therefore, which presents itself for consideration, and will be brought before the Committee for discussion at its next meeting is this: In what way shall the trifling financial reform be effected? I do not hesitate to state my opinion to be in favour of a voluntary increase of the half-guinea subscriptions to a guinea, by those members who would just as soon pay the larger as the smaller amount.

Certainly the course pointed to as an example across the Atlantic, of reducing official salaries, will find no favour with me. I have never yet met with a Gas Manager who would receive with complacency the application of that principle to himself for the benefit of his Company, nor have I met with a Company so demented as to imagine that by reducing the salary of their Manager they would get improved results.

And as regards the Secretary of our Association, I venture to say no one can be more thoroughly devoted to the duties of his office, nor more painstaking in the discharge of those duties, which, according to my notions, are insufficiently paid for.

A propos of the reduction of the salaries of the officers of the American Government, "from President down through Ambassadors, all the way to Consuls," I beg to quote a specimen of the "more excellent way," which I discovered in a report of a debate in the German Parliament, so recently as the 25th ult. On that occasion Prince Bismarck made it known that the salary of Count Münster, their Imperial Ambassador to the Court of St. James, has been raised to £7500, which is an increase of 25 per cent. This is a practical way of meeting the difficulty of increased expenses which the Ambassador has felt the effect of; but how the finances of our Association are to be assisted by the method suggested by Mr. Anderson, I fail to see. He says, one way to "put the Society in a position to pay its way handsomely," "would be to charm a little more intellect into it." But how "intellect" is to be "charmed" into it, and dealt with in the balance-sheet, is not quite clear to ordinary mortals. I have heard of "whistling a bird out of a tree;" but I have not heard of "intellect" being counted as coin of the realm, and I am afraid our Finance Committee would be puzzled to show a balance on the right side of the account, if the additional "intellect" to be "charmed" into the Society is not accompanied by an increase of guineas.

A few more words and I have done with the subject until the Committee meet. Permit me to say that the Joseph Humes of to-day will do well to be as careful in dealing with figures as was the veteran political economist of that name, who for many years adorned the British House of Commons. Unfortunately, the figures in Mr. Anderson's letter are very far from being correctly dealt with.

Mr. Anderson's figures are

The average income per head for the year 1877 was . . . . .	15	7	. . . . .	10	6
Cost of Secretary, do. do. . . . .	5	1	. . . . .	6	7
Leaving for all other expenses . . . . .	10	6	instead of	3	11

I merely give this one specimen in illustration of the want of accuracy perceptible in Mr. Anderson's statements, and leave all the rest to be dealt with by the Committee in regular course; and trust the members will see that, whatever else may be needed in the way of improvement, the old adage will hold good in this, as in all other cases—i.e., that "Union is Strength."

R. P. SPICE.

21, Parliament Street, Westminster, S.W., March 8, 1878.

## COMMISSIONS.

SIR,—In reply to "Inquirer," I believe it is not "correct to assume that Directors and Committees" are aware or approve of Managers augmenting their salaries by taking commission.

The system is wrong, and the sooner it is abolished the better. Manufacturers ought not to offer, and Managers should decline, that which prevents straightforward dealings between them.

The prophet's sons "took bribes and perverted judgment."

Runcorn, March 9, 1878.

J. R. FRITH.

## A HINT TO SECRETARIES, ETC.

SIR,—I am very often applied to for information by the Managers and Secretaries of other Companies, and always feel a pleasure in giving

any information I can afford. At the same time, I think the least my friends can do is to forward a stamp or stamped envelope, for the reply. I always do this myself, and think the rule is a good one.

SECRETARY.

P.S.—I have had ten such applications this week, only one of which contained a stamp.

# Parliamentary Intelligence.

## HOUSE OF LORDS.

MONDAY, MARCH 4.

The Chairman of Committees informed the House that the opposition to the Exeter Corporation Water Bill was withdrawn.

The York United Gas, and Trowbridge Water Bills were referred to a Select Committee, consisting of Lord Monteagle (Chairman), Lord Thurlow, Lord Lyttelton, Lord Dunsany, and Lord Brancepeth; to meet on Monday, March 11.

Bill read the third time and passed:—Deal Water.

TUESDAY, MARCH 5.

Bill reported with amendments:—Imperial Continental Gas Association.

Bill reported from the Select Committee, with amendments:—Batley Corporation Water.

THURSDAY, MARCH 7.

Bills reported from the Select Committees, with amendments:—Bedlington Local Board Water; Exeter Gas.

Bill reported, with amendments:—Dublin Corporation Water Works Acts Amendment.

The Chairman of Committees informed the House that the opposition to the Forfar Water Bill was withdrawn.

FRIDAY, MARCH 8.

Bills Committed:—Clitheroe Gas, Water, and Improvement; Newry Gas; Warrington Water.

Bill read the third time, passed, and sent to the Commons:—Imperial Continental Gas Association.

## HOUSE OF COMMONS.

MONDAY, MARCH 4.

Bill read a second time and committed:—Weston-super-Mare Improvement Commissioners.

Petitions against the Manchester Corporation Water Bill, and for dispensing with Standing Order 129 in the case of the said petition, were presented from Water Joint Committee of the Leigh and Hindley Local Boards.

The petitions against the following Bills were withdrawn:—Cheltenham Corporation Water, of Ecclesiastical Commissioners for England; Dalton in Furness Local Board, of Furness Railway Company; Newbury Borough Extension, of (1) Owners, &c., of lands and houses in Greenham, (2) Speenhamland Improvement Commissioners; Southport Water, of Justices of the Peace for the County Palatine of Lancaster; Tredegar Water and Gas, of London and North Western Railway Company.

TUESDAY, MARCH 5.

Bills reported.—Brading Harbour District Gas; Hartlepool Gas and Water.

The Bangor Water and Gas Bill was reported, "Parties do not proceed."

The following resolution, reported from the Standing Orders Committee, was agreed to:—"That, in the case of the Manchester Corporation Water Bill, petition of the Water Joint Committee of the Leigh and Hindley Local Boards for dispensing with Standing Order 129 in the case of their petition against the Bill, the said Standing Order ought to be dispensed with."

Lords Bill read the first time and referred to the Examiners:—Deal Water.

A petition against the Metropolitan Water Supply Bill was presented from the Vestry of St. Marylebone.

The petitions against the following Bills were withdrawn; Bournemouth Gas and Water, of Bournemouth Commissioners; Cheltenham Corporation Water, of (1) Charlton Kings Local Board, (2) Owners, &c., of houses and lands in Charlton Kings; Cockermouth and Workington Water, of Trustees of the District and Harbour of Maryport; Farnworth and Kearsley Gas, of Moses Gate and Ringley Branch Turnpike Road Trustees; Manchester Corporation Water, of (1) Lord Egerton of Tatton, (2) Mersey and Irwell and Bridgewater Navigation Company; Metropolitan Water Supply, of Commissioners of Sewers for the Levels of Havering, Dagenham, &c.

WEDNESDAY, MARCH 6.

A petition in favour of the Nottingham Water Bill was presented from Guardians of the Poor of the Basford Union.

The petitions against the following Bills were withdrawn:—Cheltenham Corporation Water, of Banbury and Cheltenham Direct Railway Company; Cockermouth and Workington Water, of (1) Michael Falcon and Mary Falcon, (2) William Parkin, (3) Sharp Braithwaite, (4) London and North-Western Railway Company, (5) Trustees under the Will of William Marshall, deceased; Shrewsbury Gas, of London and North-Western Railway Company; Weston-super-Mare Improvement Commissioners, of Great Western Railway Company.

## METROPOLIS WATER SUPPLY.

Petitions were presented by Sir T. Chambers, from Representatives of Vestries and District Boards of the Metropolitan, against the two Bills of the Metropolitan Board relating to the Water Supply of the Metropolitan.

On the motion of Sir Ughtred Kay-Shuttleworth a copy was ordered of report on the analysis of the waters supplied by the Metropolitan Water Companies during the year 1877, by Professor Frankland, D.C.L., F.R.S., &c.

THURSDAY, MARCH 7.

The Examiners reported that the Standing Orders had been complied with in the case of the petition for additional provision in the West Houghton Local Board Bill.

The petitions against the following Bills were withdrawn:—Cardiff Water, of Great Western Railway Company; Manchester Corporation Water, of Midland Railway Company; Shrewsbury Gas, of Great Western Railway Company.

The locus standi of the following petitioners against the Radcliffe and Pilkington Gas Bill has been disallowed:—(1) Governors of the Bolton Free Grammar School, (2) Little Lever Local Board, (3) Radcliffe Local Board, (4) Prestwich Local Board, (5) Whitefield Local Board, except as against so much of clause 4 as relates to the right of way over the footpath therein mentioned.



**METROPOLIS WATER-WORKS (PURCHASE) BILL.**—A petition was presented by Alderman Cotton, from the Commissioners of Sewers of the City of London, against the second reading of this Bill; and praying that, if it be read a second time, it may be referred to a Select Committee, and that petitioners may be heard by themselves, their counsel, agents, and witnesses.

FRIDAY, MARCH 8.

Bills reported:—Bangor Local Board; Marske and Saltburn Gas; Sevenoaks Water.

A petition against the Manchester Corporation Water Bill (the petitioners not praying to be heard) was presented from Members and Associates of the Institute of Painters in Water Colours.

The petitions were withdrawn of (1) Manchester, Sheffield, and Lincolnshire Railway Company, (2) Cheshire Lines Committee against the Manchester Corporation Water Bill.

**METROPOLIS WATER-WORKS (PURCHASE) BILL.**—A petition in favour of this Bill was presented from the Limehouse Board of Works.

SATURDAY, MARCH 9.

Petitions against the Metropolitan Water Supply Bill were presented from Vestry of Lambeth,\* and (the petitioners not praying to be heard) from Vestry of St. Marylebone.

## Legal Intelligence.

**DARLINGTON COUNTY COURT.**—WEDNESDAY, FEB. 27.

(Before Mr. E. R. TURNER, Judge.)

CROFT AND HURWORTH GAS COMPANY v. FRYOR.

DAMAGING GAS-MAINS.

Mr. STEAVENSON appeared for the complainants, and Mr. ROBINSON for the defendant.

The plaintiffs in this action sued the defendant, who is the contractor under the Rural Sanitary Authority for laying the sewers at Hurworth, to recover £24 3s. 1d. for damaging pipes and leakage of gas during the progress of the sewerage works. The case came on for hearing on the 12th ult., and, after some evidence was given, an adjournment took place until this day.

Mr. Christopher Terry, the Manager of the Croft and Hurworth Gas Company, stated that last year he found there was a considerable quantity of gas unaccounted for. On the 13th of May he found a pipe broken opposite the church. The pipe appeared to have been broken by striking a pickaxe into it. They repaired it temporarily, and afterwards permanently. He told defendant about it, and he replied that he was to do the job himself. Another pipe at Skiney Row was broken by the defendant while filling up the hole made for their pipes, neglecting to board the gas-pipe. A lamp-post was also injured by the ground giving way, and a third pipe had broken opposite to Mr. Grey's house. Considerable leakage took place, which was caused by the breakage of the pipes. The three retorts he had working he found insufficient for the supply of gas, and he had to start three others.

In cross-examination by Mr. ROBINSON, witness stated that, during a portion of the time the sewerage works were going on, the Company were engaged relaying some of their pipes, but they took every precaution to prevent leakage. Mr. Graham, the Contractor at Hurworth Place, told him of the leakage, but it was a very small one. The subsidence of the soil caused the weight of the gravel upon the pipes to break them, but that would have been prevented if the pipes had been properly timbered.

Mr. J. Hall, Secretary to the Company, spoke to the breakage of the pipes, and produced the books, showing the amount of leakage which had occurred. From the 18th of May to the 23rd of June the make of gas averaged 4596 feet per day, being a total of 165,470 feet; but between the 23rd of June and the 15th of August they made 305,370 feet, being an average of 6362 feet per day, being 1766 feet per day in excess, the leakage making the difference.

Mr. W. Smith, Engineer to the Darlington Corporation Gas-Works, said that he should not consider a leakage of 17 per cent. of gas excessive, although he should like it to be much less. Before they relaid the pipes at Darlington the leakage was 23 per cent., but since that time it had been reduced to 6 per cent. The leakage at Hurworth was as much as 36 per cent. He saw the pipes taken up by the Gas Company at his suggestion, and they were in good condition. They were taken up because they were too small.

Mr. ROBINSON, on behalf of the defendant, said that the works were carried out by the Contractor under a statutory authority, whereas the gas-works belonged to a private Company who had no Act of Parliament, and therefore had no right to place their pipes there.

Mr. STEAVENSON said, although that was the case, the Company had acquired a right, their pipes having been down 20 years.

The JUDGE: They were put down in 1858.

Mr. STEAVENSON said that was when the Company were registered. He contended that the right was acquired if the Company entered upon the twentieth year without being interrupted.

Mr. ROBINSON: But the 20 years must run.

Mr. STEAVENSON said that if the pipes were put down by a wrongdoer and taken over by the Company when registered, the easement would be acquired. He thought he could bring evidence to prove that the pipes were laid in 1857, and afterwards taken by the Company.

Mr. ROBINSON contended that the Rural Sanitary Authority were the proper parties to sue.

The JUDGE: I think the case of *Reed v. the Darlington Highway Board* determines against you.

Mr. ROBINSON said that the cases did not run on all fours.

After a lengthened argument, the learned Judge stated he would consider the points raised by Mr. Robinson, and adjourn the further hearing of the case for a fortnight.

On the hearing being resumed,

Mr. STEAVENSON said the question had been raised as to whether the pipes were properly put down or not. He wished to call Colonel Scurfield, who was a freeholder, and who would state that the land was the property of the freeholders of the adjoining houses, and they had exercised rights from time to time over the green.

The JUDGE: Was consent given by the freeholders?

Mr. STEAVENSON: Consent to lay the pipes was given at a Vestry meeting, which consisted of freeholders.

The JUDGE: Freeholders might be there, but consent was given by the inhabitants?

Mr. STEAVENSON stated that, by the Watching and Lighting Act, power was given to a portion of the village to allow of lighting; and he contended that the pipes were there rightly, and the defendant was, therefore, liable for any injury that might be done.

Colonel G. J. Scurfield stated that he was one of the freeholders of

Hurworth, and had resided in the village for many years. There was no Lord of the Manor.

Mr. STEAVENSON said it was called the Vicar's manor, or Church Row property.

Witness stated that, as one of the freeholders, he claimed a right over the green opposite his house to dig gravel, lay drains, or do anything he wished so long as he did not materially interfere with the surface. If he did interfere with the surface he had to put it right again. The provisions of the 3rd and 4th Will. IV., cap. 90, were adopted by part of the inhabitants in 1858, when it was resolved to light the village within certain limits with gas. There having been opposition to it, a poll subsequently took place, which confirmed the resolution of the Vestry. Witness was about to read the resolution of the Vestry, but

Mr. ROBINSON contended that the minute-book was not admissible as evidence.

Witness said that he saw Mr. Collier, the Chairman, sign the minute, and it was allowed to be read.

Mr. ROBINSON, for the defence, raised a number of legal points. He contended, first, that the plaintiffs were trespassers, having no authority to lay down their pipes. And they had acquired no easement, their pipes not having been laid down more than 19 years.

The JUDGE said that the provisions of the Act were carried out; therefore it did not matter whether it was last year, or 15, or 50 years ago. The Act authorized them to lay their pipes.

Mr. ROBINSON then submitted that the plaintiffs had no *locus standi* in that Court, for the action had been wrongly brought. They had no right to come there at all; for it was a settled principle that when the Legislature authorized certain things to be done, and damage resulted from that, they must get their remedy in the mode provided by Act of Parliament. According to the 308th section of the Public Health Act of 1875, it was provided that all questions of damage caused by carrying out the provisions of the Act must be settled by arbitration in the manner provided by the Act, except when the amount was under £20, when it could be settled by a Court of Summary Jurisdiction.

The JUDGE pointed out that, at the option of the Rural Sanitary Authority, the County Court had jurisdiction up to £50.

Mr. ROBINSON said that, in that case, the Local Authority did not exercise that option.

The JUDGE remarked that, according to the argument for the plaintiffs, it was not the necessary work of carrying out of the Act itself that damaged the pipes, but the negligent conduct of the defendant in the matter.

Mr. ROBINSON submitted next, that under the Public Health Act, a month's notice of the action should have been given in order that a statutory defence might have been pleaded.

The JUDGE said that it was doubtful whether the general orders of the County Court did not go beyond the Act of Parliament. He found, however, that the rules had been drawn up by a competent authority, and until they were upset he must be guided by them, and must overrule the objection.

Mr. Croade, the Inspector of the Rural Sanitary Authority, gave evidence that, during the time the work was proceeding, he frequently visited the work, which was being carried out in a skillful manner. Every precaution appeared to be taken to avoid damaging the plaintiffs' pipes, and the men might without any negligence come upon the pipes.

Mr. Webster, Clerk of the Works, said that the Manager of the Gas-Works asked them to be careful in digging the drain, because he did not know where the gas-pipes might be. He gave orders that the men were to be careful, but it was impossible, when digging, to avoid coming accidentally across the pipes. That was the case with the pipes at the church gates. He gave evidence of the manner in which the pipes were shored up in other places, expressing his belief that the damage in one case was caused by a heavy cart going over a pipe, it being only about one foot beneath the surface. When the work was completed, 1800 feet of timber was left in the drains.

The Defendant was then called, and in the course of his examination he admitted that he told the plumber, on the occasion of the first breakage near the church gates, to put in as little new stuff as he could, and to do it as lightly as possible.

The JUDGE said that the plaintiffs were entitled to recover in that case. The gas-pipes were laid down before the Authority had an existence; they stood, therefore, in the same position as the Gas Company. The soil in which the pipes were laid did not belong to the public in the slightest, but to the owners of the adjoining property, subject to the easement of the pipes over it. If the adjoining proprietors had allowed persons to lay gas-pipes down, no one had a right to damage them. It was like a man placing a cart in another person's field—every one had no right to go and break the cart to pieces. The landlord would have a right to complain, and prevent the acquirement of an easement by a 20 years user. He did not think that section 308 of the Public Health Act applied, inasmuch as the damage was not caused by carrying out the Act, but through the negligence of the defendant. He gave judgment for the full amount claimed, with costs.

**REMOVING WATER-PIPES WITHOUT PERMISSION.**—Last Thursday at the Leeds Town Hall, John Moorin, a grocer, was summoned by Mr. George Wood, the Chief Inspector of water-fittings to the Leeds Corporation, for a breach of the 51st section of the Water-works Clauses Act, 1847, in removing a pipe and other works in connection with the water supplied by the Corporation, without giving the required six days' notice, whereby he was subject to a penalty not exceeding £5. It appeared that on Wednesday the 27th of February, there was a sale by auction in Marsh Lane, the defendant purchasing certain lead piping, which he removed at the conclusion of the sale. He pleaded guilty to removing the piping, but said he had been misled by what the auctioneer had stated. He understood that he could remove his property at once, without giving notice. The Town Clerk (Mr. G. W. Morrison) said he took the proceedings because of the great inconvenience that had arisen at various times to the Corporation and the public, owing to the removal of these pipes without the proper notice having been given. The Bench, believing that the defendant had been misled, thought the justice of the case would be met by ordering him to pay the costs.

**DISPUTE AS TO LIGHTING A COMMON STAIR.**—On Thursday, Feb. 21, 33 persons appeared simultaneously at the Edinburgh Police Court charged, at the instance of Mr. Paterson, Inspector of Cleaning and Lighting, with contravening a local Act by failing to light a lamp in the common stair at No. 2, Drummond Street, where they reside. Some of the parties denied the charge, and the case was delayed till the following Saturday, when the accused again appeared before Bailie Tawse. The prosecutor, Mr. Paterson, led evidence, from which it appeared that the lamp in question was in a passage off the street; that there were no houses in the passage; and that the accused had all been duly warned of the consequences if the lamp was not lit. Several of the defaulters asked to be heard, and from the tenor of their remarks it appeared that they could not agree as to the payment, nor as to who should take the trouble of going down the stairs to light the gas. Some thought the onus of lighting lay upon the person to whom they paid their shares, and who gave orders

\* This petition is also against the Metropolitan Water-Works (Purchase) Bill.



to the Gas Company; others seemed to think that, the lamp being in a passage in which there were no houses, the responsibility of lighting and supplying it with gas rested elsewhere. The lamps on the landings above were said to be regularly lighted. The presiding Magistrate said that the lighting of the passage lay solely on the parties at the bar, and they must agree amongst themselves about it, otherwise they should be brought before the Court again and fined.

## Miscellaneous News.

### METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS.

At the usual Weekly Meeting on Friday last—Sir J. Hogg in the chair—

The Parliamentary Committee reported, *inter alia* that the Bill introduced into the House of Lords by the Lord Chancellor to amend and consolidate the Gas-Works Clauses Act, does not in any way affect the Metropolis.

The Works and General Purposes Committee brought up a report, in which they recommended that the Board of Trade be informed, in reply to their communication on the subject of the proposed alteration of the penalty clauses of the Acts of The Gaslight and Coke, the Commercial and the South Metropolitan Gas Companies, that the Metropolitan Board object to the insertion of the words "not exceeding" in the proposed new clauses, as suggested by those Companies.

Mr. RICHARDSON said this matter, which had been very carefully considered by the Committee, was of great importance to the public, and also to the Companies. At the present time the penalties, although very heavy, could only be enforced with great difficulty, in consequence of it being necessary to specify the station or manufactory at which the defective gas was made and also the quantity of gas made at such station on the day the defect was detected. The Metropolitan Board had suggested to the Board of Trade that the law should be amended so as to make the penalty recoverable in respect of the gas tested, without reference to the works at which it was made, and that a fixed penalty of £25 should be substituted for a defect, in lieu of a penalty of £2 on every 100,000 feet of gas made at the works on the day the defect took place. The Companies now stated that they had no objection to this amendment of the law, on the condition that the words "not exceeding" in regard to the penalty of £25 were inserted. The Committee, having fully considered the proposal, thought that the insertion of those words would not afford a sufficient protection to the consumers interests; and they therefore recommend that the reply to the Board of Trade should be, that in the opinion of the Board the insertion of the words "not exceeding" should not be allowed. He moved the adoption of the report.

Mr. RUNTZ said he thought the Committee were recommending the Board to adopt a most unusual course. In the penalty clauses of the Board's own Bill for the amendment of the Building Acts, the words "not exceeding" were included. He moved as an amendment that the report be referred back to the Committee for reconsideration. The Committee were asking that what was the usual course of legislation should not be followed in regard to this matter.

Mr. LE BRETON seconded the amendment.

Mr. H. L. TAYLOR thought there was one point which was sufficient to justify the Committee in submitting this recommendation to the Board, and that was that the Gas Companies of London had a great monopoly.

Mr. ROBERTS said he was afraid that these two words, if inserted, would give rise to a great deal of unnecessary litigation. In the interests of the public, and even in the interests of the Companies themselves, it was better that a fixed penalty should be laid down.

The amendment was negatived and the report was adopted.

Dr. Stevenson's report on the gas supplied by The Gaslight and Coke Company to the Vestry of St. Pancras, during the month of February, 1878—Maximum light, estimated by sperm candles, according to the Act—19.0. Minimum light, sperm candles—16.5. Average light, sperm candles—17.2. Traces of ammonia, indicated by turmeric test paper—Traces on all occasions. Traces of sulphuretted hydrogen, indicated by lead test paper—None on any occasion. Sulphur 15.1 grains per 100 cubic feet of gas.

### METROPOLIS WATER SUPPLY.

DEPUTATION FROM VESTRIES AND LOCAL BOARDS TO THE PRESIDENT OF THE LOCAL GOVERNMENT BOARD.

On Friday last, a numerous deputation of representatives of Vestries and District Boards of the Metropolis had an interview with Mr. Slater-Booth, M.P., at the offices of the Local Government Board, for the purpose of stating the grounds of their opposition to the Metropolis Water-Works Purchase, and the Metropolis Water Supply Bills. The deputation was introduced by Sir T. Chambers, M.P., and included Lord Frederick Fitzroy, Colonel Beresford, M.P., Dr. Brewer, Major Lyon, and Mr. Berry (St. George's, Hanover Square), Mr. Watkins (St. Pancras), Mr. J. K. Aston (Westminster), Mr. Wade and Mr. Todd (Marylebone), Mr. J. E. Cox and Mr. George Hill (Lambeth), Mr. Saywell (Clerkenwell), Mr. White-way (Greenwich), and Mr. Dillon (Chelsea).

Sir T. CHAMBERS said that he had to introduce a very influential deputation of representatives of Vestries and District Boards of the Metropolis, who were strongly opposed to the two Water Bills promoted by the Metropolitan Board of Works, one being a Bill for the supply of water for certain purposes, and the construction of water-works by the Board; and the other a Bill for the purchase by them of the works and undertakings of the several Water Companies. As regarded the first of these Bills, which was intended to secure a duplicate supply of better quality than the existing one, it was objected that, supposing such a supply could be obtained for the whole of the Metropolis, the success of the scheme must depend very much indeed on the fidelity and carefulness of servants, and that one would never know whether one had the new supply or the old one. The deputation asked that that Bill, which had been read a second time, should not be proceeded with. The second Bill could not be passed without the first.

The PRESIDENT said he doubted whether he had anything to do with the first Bill, it being about to be referred to a Select Committee.

Sir T. CHAMBERS said that Bill would authorize the laying down of 2600 miles of new pipes, and that, supposing 500 miles a year were laid down, this would involve an enormous amount of inconvenience for five years. The second Bill, that for the purchase of existing works, would lead to a very heavy taxation of the Metropolitan community. The deputation believed, too, that, under existing Acts, the Water Companies could be compelled to improve the water supply both in quantity and in quality, while they also thought that on a question of such magnitude they ought to be allowed *locus standi* before the Committee.

Mr. WATKINS, of St. Pancras, said the Metropolitan Board of Works had served his Vestry with a notice that they objected to their having *locus standi* before the Committee.

The PRESIDENT remarked that the question had not been decided.

Mr. WATKINS said, upon this question, public feeling was very much excited. The new scheme was one that proposed to take up all the footways, and the ratepayers would have to pay compulsorily for the supply. They also objected to the Purchase Bill, and they were at this disadvantage—that the Metropolitan Board could use the money of the ratepayers. The Kent Company in 1876 called upon the Board to say where they would have hydrants fixed, and as the Board refused to say, the Company laid down 64 hydrants, at a cost of £3 8s. each.

Mr. BERRY, of St. George's, Hanover Square, said he wished to guard himself against the idea that the deputation were opposed to any scheme to meet a proved necessity of water supply, and they asked for delay. He referred to a report of Dr. Tidy, which showed that the water supplied by the Companies was as good as the water supplied by any other Corporation. As to the supply scheme of the Metropolitan Board, he considered it would be cumbersome and ineffectual. The brewers had not always obtained what they wanted from the source the Metropolitan Board relied upon—namely, the chalk.

Mr. GEORGE HILL, of Lambeth, said there was no proof that if the scheme were carried out the ratepayers would get the value of their money, adding that the Metropolitan Board of Works were most extravagant, and did not possess the confidence of the ratepayers generally.

The PRESIDENT, in reply, said that he had listened with interest to the remarks which had been made, but he must say a great many of them would form proper matter for discussion in Committee when the Bills reached that stage. Complaint had been made that the *locus standi* of the Vestries before the Committee, for the purpose of being heard by counsel against the Bills, was opposed; but he had no doubt that, if such *locus standi* were refused, some other means would be found of bringing their views before Parliament. He considered it would be unbecoming of Government to interfere with a Bill which had been read a second time; but the first Bill was, of course, subject to whether the second Bill obtained a second reading. He did not doubt that the sentiments which had been expressed would receive great consideration in the House of Commons, where the districts had, of course, their members, and it would be his duty to submit them to the Government. The Government would not be disposed to take a leading part in the matter until they were satisfied as to the feelings of the people of the Metropolis. He agreed that, as regarded the purity of the water supply, the case was not so urgent as some people appeared to think. If the Royal Commission and the Duke of Richmond were right in speaking in favour of that supply of drinking water some 10 or 12 years ago, experience had proved to him—he having charge of the Water Acts—that it had since improved, and there was no serious cause for alarm on the subject. The increase of cost arising from delay was another matter, and that doubtless would receive due consideration in the House of Commons. He had already received a deputation on this subject, and he need hardly say that deference must be paid to the views and policy of so important a body as the Metropolitan Board of Works.

Sir THOMAS CHAMBERS thanked the President for his courtesy, and the deputation withdrew.

### PUBLIC MEETING IN LAMBETH.

On Friday evening last a meeting was held at the Lambeth Baths, under the presidency of the Rev. G. M. MURPHY, "to adopt measures to prevent the Metropolitan Board of Works expending £30,000,000 in carrying out a gigantic scheme for purchasing the Water Companies of London."

The CHAIRMAN having explained the object of the meeting, said that, however good the object of the Board of Works might be, the project was too gigantic to be allowed to be carried out without full and careful inquiry. The treatment which the Board of Works had dealt out to South London had not given very general satisfaction; and besides, the proposed amalgamation of the water-works, together with the work of subsequent administration, would be too much for the Board. Many of the members of the Board itself were opposed to the scheme of the Board of Works, and he had received a letter that evening from Mr. Fowler, stating that he and his colleague Mr. Taylor wished the meeting every success. Mr. Fowler intimated his belief that the matter would not go this year beyond inquiry. Artesian wells had been spoken of as a source of supply, but it must not be forgotten that Sir H. Meux had sunk one at his brewery at a cost of £10,000 which had proved a complete failure. Lakes Windermere and Thirlmere had also been spoken of, but the water was not suited for domestic purposes.

Mr. G. HILL moved: "That this meeting protests most strenuously against the proposal of the Metropolitan Board of Works to tax the ratepayers of London to the extent of £30,000,000 for purchasing the interests of the Metropolitan Water-Works Companies." He stated that he, as one of a deputation, had that afternoon seen Mr. Slater-Booth, and that gentleman intimated his opinion that Government would not allow the Bill to pass during the present session.

Mr. CAVE seconded the motion, which was carried unanimously.

A resolution to present a petition to the House of Common against the Bill, and also one recommending that the members of the Board of Works should be elected directly by the ratepayers, terminated the proceedings.

CITY OF LONDON COURT OF SEWERS.—At the weekly meeting of the Commissioners on the 5th inst., a report was submitted by the Finance and Improvement Committee, recommending the Court to petition Parliament against the second reading of the Metropolis Water-Works Purchase Bill, stating that an additional supply of water was not needed in the City, and the laying down of new mains would cause very great and unnecessary inconvenience; and that the Corporation, while having to bear a very large share of the cost, would have absolutely no control over the supply. In the course of a conversation which ensued on a motion to agree with the Committee in their report, Mr. H. L. Taylor, the representative of the Commission at the Metropolitan Board, strongly condemned the proposal to buy up the Water Companies, and urged that what was wanted was to have more control over the Companies, so as to increase the purity of the water and lessen the cost. The motion was agreed to; the petition to Parliament against the Bill was submitted and signed, and the Sheriffs were requested to present the same to the House of Commons.

ISLINGTON VESTRY.—At the meeting of the Vestry on the 1st inst., the General Purposes Committee reported that "They are of opinion that the Metropolitan Board of Works have entered upon a proceeding of a doubtful character, without first ascertaining the views of their constituents upon the subject, with the undesirable result of encouraging the Water Companies to increase their charges for water to the highest point allowed by law, in order that they may obtain the highest possible compensation for the surrender of their property, and also with the certainty of a very large outlay in parliamentary and other expenses; but as the Board have proceeded so far, your Committee think that the Purchase Bill should be carried through, but that the new Water Supply Bill should be abandoned, at all events for the present." The motion was agreed to, and a copy directed to be sent to the Board.



The following are the returns of the Society of Medical Officers of Health, on the Composition and Quality of the Metropolitan Waters in February, 1878:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen Nitro- required, gen- by Organic As Ni- Matter, trates &c. &c.		Ammonia.		Hardness (Clarke's Scale).	
		Grs.	Grs.	Grs.	Grs.	Before Boil- ing.	After Boil- ing.
<i>Thames Water Companies.</i>							
Grand Junction . . . . .	22.40	0.052	0.165	0.000	0.010	14.8	3.7
West Middlesex . . . . .	21.40	0.063	0.159	0.000	0.009	13.7	3.3
Southwark and Vauxhall . . . . .	21.90	0.049	0.150	0.000	0.009	14.3	3.3
Chelsea . . . . .	21.40	0.052	0.165	0.001	0.009	14.3	3.3
Lambeth . . . . .	23.60	0.049	0.165	0.001	0.009	14.8	3.7
<i>Other Companies.</i>							
Kent . . . . .	28.40	0.003	0.315	0.000	0.003	18.8	6.5
New River . . . . .	21.80	0.038	0.195	0.000	0.009	13.7	2.7
East London . . . . .	24.90	0.066	0.135	0.000	0.009	15.9	4.2

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases.  
C. MEYMOTT TIDY, M.B.

THE PURCHASE OF THE STAFFORD GAS-WORKS.

Sir H. A. Hunt, the Umpire in the recent arbitration to determine what amount should be paid by the Corporation of Stafford for the purchase of the undertaking of the Stafford Gas Company, published his award on the 1st inst., and the same was made known at the meeting of the Town Council on Tuesday last.

The award recites at considerable length the circumstances which led up to the arbitration by Mr. F. J. Bramwell, C.E., on the part of the Corporation, and Mr. G. W. Stevenson, C.E., on the part of the Company, and goes on to state that the Arbitrators, before they entered upon the matters referred to them, nominated Sir H. A. Hunt to be Umpire, under the provisions of the Stafford Corporation Act, 1876, and the Railway Companies Arbitration Act, 1859, the arbitration being subject to the last-named Act. The Arbitrators having failed to agree on their award, the matter was referred to the Umpire, and he has determined—

1. That the consideration for the purchase shall be paid in gross, and not by annuities.
2. That the consideration to be paid by the Corporation to the Gas Company for the purchase of their undertaking shall be the sum of £70,000.
3. That the time for the transfer shall be the 30th day of June, 1878.
4. That on the 30th day of June, 1878, the Corporation shall pay the sum of £70,000 to the Gas Company.
5. That on the 30th day of June, 1878, the Corporation shall become entitled to the possession of the undertaking (including all property, rights, powers, and privileges of the Gas Company), and to all money then in the hands of the bankers of the Company; and all rents or other sums of money then due or accruing due to the Gas Company, but subject to all the debts and liabilities of the Company; and the Corporation shall also be entitled to the benefit of, and be subject to all the liability of, the Gas Company under any contracts then existing entered into by the Gas Company.
6. That the Corporation shall pay to the Proprietors of the shares in the Gas Company the maximum dividend allowed by the Acts of Parliament regulating the Company in respect to their shares, up to the 30th day of June, 1878; such dividend to be payable within one week after the 30th day of June, 1878.
7. That in case the Corporation shall fail to pay the sum of £70,000 on the 30th day of June, 1878, they shall pay to the Company interest thereon at the rate of 4 per cent. per annum up to the time of the payment thereof, unless such payment shall be delayed beyond the 1st day of January, 1879, in which case the Corporation shall on that day pay to the Gas Company, by way of interest, a sum equal to 10 per cent. on the sum of £70,000, and shall continue to pay interest at the last-mentioned rate, by equal half-yearly payments, until the sum of £70,000 shall be actually paid.
8. That the Corporation shall pay the costs of and attending the arbitration, and of the award.

It will be remembered that the price fixed by the Company at which they would sell their undertaking was £76,000, exclusive of their bonded debt, and that the Corporation offered to purchase for £65,000, including the debt. The award of the Umpire does not include the debt, and, therefore, the actual price the Corporation will have to pay will be about £10,000 more than their original offer, and the Company will obtain about £6000 less than they asked.

At the meeting of the Town Council above mentioned, The Mayor, referring to the award, said he thought the Shareholders of the Company had had a very good price given to them, but, at the same time, the Corporation would become possessed of what were acknowledged to be some of the best gas-works in the kingdom, and he had every reason to anticipate a considerable profit to the town by the purchase.

The TOWN-CLERK said it had hitherto been the mission of the Council to beat down the Company's price to the lowest possible figure, but they had always done so fairly; and in justification of the views of the Council, he thought he might now properly call attention to some figures based upon the price awarded. The Company's accounts for last year showed that they had, in June, £1916 11s. 10d. available for dividend, and in December, £1515 11s. 2d., or a total of £3432 3s. Then they might take out of their accounts an item which would not affect the Corporation—viz., £225 for the remuneration of the Directors and Auditors, and as their work would be transferred to a Committee of the Corporation, there would be a clear saving of £200 a year in that respect. The Company had been in the habit of saving 1 per cent. on their nominal capital for depreciation, but it would not be necessary for the Corporation to provide for depreciation in any form at present. He saw no reason why they should not have the full benefit of any profit they might make, at all events for the next three years, and he had therefore allowed £579 2s. 8d. for that. Then there would be a saving of £69 3s. 6d. now paid by the Company for interest, and adding these figures they would arrive at a total of £4280 9s. 2d. Assuming the costs of the arbitration to be £1000, of which he might say £500 had been paid to enable them to take up the award, the interest which would have to be paid, at the rate of 4 per cent., on £71,000 would amount to £2840, and this would leave a surplus of £1440 9s. 2d. per annum for the next three years for the benefit of the Corporation.

LUTON WATER COMPANY.—At the half-yearly meeting on the 26th ult., a dividend of 9 per cent. was declared, £50 advanced to the reserve-fund, and a balance of about the same amount carried forward.

BRIGHTON GASLIGHT AND COKE COMPANY.

The Half-Yearly Meeting was held at the London Offices of the Company, Moorgate Street Chambers, on Thursday, the 28th ult.—JOHN MILES, Esq., in the chair—when the following report was presented:—

Compared with the corresponding period of 1876, the demand for gas during the last six months shows a moderate increase; but the Directors have experienced great disappointment in the price realized for coke, which, however, is a complaint almost universal among Gas Companies.

An unusual number of storms have occurred in the course of the year, severely testing and proving the capabilities of the new groyne at Blackrock, and of the sea-wall previously erected to resist inroads of the sea; while at some distance beyond the eastern termination of the wall a large body of unprotected cliff has yielded to the violence of the waves.

It having become necessary to re-sheet the crown of a large gasholder, which, already weakened by the effects of time, was seriously injured by a severe gale of wind, that important operation was completed before the busy season; and it was satisfactory to find that, notwithstanding the wear of some eight-and-twenty years, the interior framework of the holder was in sound condition.

Some further alterations and improvements in the manufacturing department are in contemplation, to be proceeded with as soon as the exigencies of the season permit.

The Directors recommend the declaration of a dividend on the paid-up capital of the Company of 5 per cent. for the half year ending the 25th of December last; the same to be payable, free of income-tax, on and after the 15th of March.

Two of the Directors (Mr. Walne and Mr. Miles) and one of the Auditors (Mr. Sarson) retire by rotation, but are all eligible for immediate re-election.

Dr.

Profit and Loss Account, for the Half Year ending Dec. 25, 1877.

Cr.

Coals	£12,821 16 10	Gas and meter rental	£21,340 3 10
Materials for purification	385 2 0	Coke, &c.	4,184 18 5
Wages	2,314 13 5	Old stores, &c.	51 0 8
Rent, rates, and taxes	322 6 1		
Salaries, Collectors commis- sion, Directors, & Auditors	1,411 9 10		
General charges	162 0 2		
Wear and tear	2,578 1 1		
Bad and doubtful debts and allowances	120 0 0		
Balance	5,460 13 6		
£25,576 2 11		£25,576 2 11	

Balance-Sheet.

Capital	£107,782 0 0	Expended in works	£89,599 11 9
Contingency-fund	5,775 12 6	Meters	2,167 11 7
Depreciation account	1,977 3 11	Works in progress	11,198 8 3
Coal insurance account	1,725 7 1	Coal, coke, &c., in stock	6,074 14 1
Dividends unpaid	1,969 2 9	Mains, service-pipes, and general stores in stock	1,336 14 3
Tradesmen's accounts, &c., owing	3,542 0 1	Sundry debtors for gas	14,916 14 5
Temporary loan	2,029 11 2	" " coke, &c.	2,383 8 7
Profit and loss balance— From last half year	£371 3 8	Cash at bankers and in hand	2,955 11 9
This half year, as above	5,460 13 6		
£130,632 14 8	5,831 17 2		
£130,632 14 8		£130,632 14 8	

The report having been adopted, and the dividend recommended therein declared, the retiring Directors and Auditor were re-elected, and thanks were voted to them and to their colleagues for their past services.

It was also resolved—"That the best thanks of the meeting be given to Mr. Rutter, Mr. Liddall, and the other officers of the Company."

The proceedings closed with a similar compliment to the Chairman.

BIRMINGHAM CORPORATION GAS-WORKS.

At the Meeting of the Birmingham Town Council, on Tuesday, the 5th inst.—the Mayor (Alderman Kenrick) presiding—

The annual report of the Gas Committee was presented. It stated that the suit of Messrs. Allen and Holden, referred to in the report presented on the 2nd of October last, had been definitely settled, and on appeal the damages were reduced to £1549 5s. 4d. The report referred to the arbitration proceedings with the Local Boards with regard to the purchase by them of their portion of the gas undertaking. The re-arrangement of mains being now practically completed, the Committee submitted a statement showing the nature and extent of the work done during the two years ending the 31st of December last. As the result of the alterations, there was now no want of gas in any portion of the district. The mileage of mains in 1875 was 506. During 1876 there were taken up of duplicate mains 25,367 yards; during 1877, 18,518 yards; leaving 846,675 yards, or 481 miles, to supply the same area as the 506 miles did. A total of 930,851 yards of mains had been laid in streets and roads newly occupied. Although the area of supply had been increased 44,176 yards, or 25 miles, the total mileage of mains was only 291 yards more than in 1875, a reduction which had already had the effect of reducing the leakage of gas 14,041 thousands. During the two years the number of services enlarged or repaired was 11,098; the number of duplicate services taken up or laid dead was 3102. The Committee reported the completion of the Sutton extension, with the exception of a small portion. The cost of the work, including taking up the 12-inch main from Aston, and relaying the 16-inch from West Bromwich district, was £6600. The report gave a description of the manufacturing work completed, including at Neshells New Works a gas-tank 200 feet in diameter and 36 feet deep, the holder to contain 2,100,000 cubic feet, being the largest out of London. The result of the working of the locomotive for shunting was to effect a saving at the rate of £680 per annum. The total expenditure on capital account to the present time, in respect of the vote of the Council 10,216, amounted to £82,534. The new regulations for the supply of gas had worked satisfactorily. The unpaid accounts and arrears on the 1st of January amounted to £8473 14s. 5d., as compared with £20,674 2s. 3d. for the corresponding period of 1876; and the arrears for gas and fittings on the 1st inst. were £2636 8s. 1d., against £7246 11s. 4d. in March, 1876. The Committee recorded the resignation of Mr. Parry, owing to his state of health, and the appointment of Mr. Edwin Smith as his successor. The long-continued depression of trade in the town and district had had a prejudicial effect on the sale of gas, the total quantity sold during the past year being 2,639,054,000 feet, as compared with 2,655,517,000 feet for 1876, or an apparent decrease of about 16 millions; but to the quantity for 1877 should be added the average six months sale in previous years to Walsall—say, 25 million feet. This would make the total sale for 1877 about 2664 million feet, and an increase would be shown equal to about 36 per cent. The total quantity of coke in stock at the end of the year was 26,263 tons, against 22,556 tons at the end of 1876. The sale of coke for 1877 amounted to £55,868, a decrease of £14,922, as compared with 1876. The average illuminating power of the gas for the year was 17.29, or about 24 candles in excess of the parliamentary standard. The balance-sheet submitted to the Council showed that the net profit for the year amounted to £36,684 19s. 4d. The sum of £3937 6s. 4d. had been appropriated to the sinking-fund for redemption of loans and annuities, making a total sum under that head of £7924 14s. 6d. The balance of the profit and loss account for the year ending December last—£11,684 19s. 4d.—the Committee proposed to carry to the reserve-fund account, making the amount £41,184 2s. 3d.

The balance-sheet for the past year is as follows:—



### A.—STATEMENT OF LOAN CAPITAL.

Dr.				B.—CAPITAL ACCOUNT.								Cr.					
Expenditure to Dec. 31, 1876.				Expended this Year.		Total to Dec. 31, 1877.		Certified Recpts. Dec. 31, 1876.				Received during Year.		Total Receipts to Dec. 31, 1877.			
£ s. d.				£ s. d.		£ s. d.		£ s. d.				£ s. d.		£ s. d.			
To Expenditure to Dec. 31, 1876 . . . . .				2,084,530 7 8		..		2,084,530 7 8		By Debenture stock . . . . .				48,650 0 0		48,650 0 0	
Since that date—																	
Lands acquired, including law charges . . . . .				..		2,284 0 4		Mortgage and bonds . . . . .				657,350 0 0		90,688 9 4		748,038 9 4	
Extension of buildings, manufacturing plant, machines, storage works, and other structures connected with manufacture . . . . .				70,266 19 4				Annuities (capitalized at 25 years purchase) . . . . .				1,406,686 5 0		..		1,374,186 5 0*	
Less plant abandoned. . . . .				8,000 0 0													
				62,266 19 4													
New mains, including laying same, paving, and other work connected with distribution . . . . .				..		11,738 0 1											
New meters (not in place of old ones) . . . . .				..		3,431 19 4											
Less capitalized value of the annuity, payable by the Corporation of Walsall, for the part of the undertaking purchased by them . . . . .				79,720 19 1													
				32,500 0 0													
						47,220 19 1											
Total expenditure . . . . .						2,131,751 6 9											
Balance of capital account . . . . .						39,123 7 7											
						2,170,874 14 4											
																2,170,874 14 4	

[illegible]

	£	s.	d.		£	s.	d.
To Amount carried to reserve-fund account (E) from profits of 1876 . . . . .	4,122	5	7	By Balance of net profit brought from last account . . . . .	31,122	5	7
Interest on temporary loans . . . . .	1,467	14	1	Less amount paid to borough improvement-fund . . . . .	30,000	0	0
Interest on mortgages and bonds, accrued to Dec. 31, 1877 . . . . .	28,191	12	8				
Interest on debenture stock to Dec. 31, 1877 . . . . .	1,946	0	0				
Annuities . . . . .	55,617	9	0	Balance brought from revenue account (C), being profit for the			
Sinking-fund, for redemption of loans and annuities . . . . .	3,337	6	4	year to Dec. 31, 1877 . . . . .	128,115	1	5
Balance, being net profit for the year . . . . .	36,681	19	4				
	£132,267	7	0		£132,267	7	0

To Amount of balance to be carried to next account . . . . .	£	s.	d.	By Balance brought from last account . . . . .	£	s.	d.
	29,499	2	1	Interest on amount invested . . . . .	21,388	15	11
				Balance brought from profit and loss account (D) . . . . .	988	0	7
					4,122	5	7
	£29,499	2	1		£29,499	2	1

To Amount of balance to be carried to next account . . . . .	£	s.	d.	By Amount brought from last account . . . . .	£	s.	d.
	£7,924	14	6	Interest on amount invested . . . . .	3,832	11	6
				Balance brought from profit and loss account (D) . . . . .	154	16	8
					3,937	6	4
	£7,924	14	6		£7,924	14	6



Cr.		G.—SUPERANNUATION-FUND ACCOUNT.		Dr.	
To Balance to be carried to next account . . . . .	£ s. d. 881 1 2	By Contributions for year to Dec. 31, 1877 . . . . .	£ s. d. 859 1 6		
		Interest allowed thereon . . . . .	21 19 8		
	£881 1 2			£881 1 2	

## H.—GENERAL BALANCE-SHEET.

		£ s. d.				£ s. d.			
To Capital account—				By Coals, for stock on hand, Dec. 31, 1877 . . . . .		18,419	3	5	
Balance at credit thereof (Account B) . . . . .	39,123	7	7	Coke and breeze . . . . .		12,281	14	0	
Profit and loss account—				Tar and other products . . . . .		2,153	11	3	
Balance at credit thereof (Account D) . . . . .	36,684	19	4	Sundry stores . . . . .		30,722	8	6	
Reserve-fund—									63,326 17 2
Balance at credit thereof (Account E) . . . . .	29,499	2	1	Gas and fittings rental, balance of this account due to the Corporation on Dec. 31, 1877, less deposits, prepayments, and reserve . . . . .		125,080	3	1	
Sinking-fund—				Coke and other residuals . . . . .		14,989	13	2	
Balance at credit thereof (Account F) . . . . .	7,924	14	6	Sundry accounts . . . . .		2,055	2	11	
Superannuation-fund—				Amount invested of reserve-fund . . . . .					142,124 18 11
Balance at credit thereof (Account G) . . . . .	881	1	2	Ditto ditto sinking-fund . . . . .					24,879 4 10
Interest accrued and unpaid on mortgages, bonds, and debenture stock, and other loans to Dec. 31, 1877 . . . . .	15,356	7	2	Ditto paid to Borough Treasurer on account of borough improvement-fund . . . . .					3,909 4 6
Annuities payable Dec. 31, 1877 . . . . .	27,783	4	6						25,000 0 0
Sundry tradesmen and others, for amounts due for coals, stores, &c., to Dec. 31, 1877 . . . . .	55,502	1	4						£259,440 5 8
Amount due to Borough Treasurer, less cash in hand . . . . .	46,685	7	9						
	£259,440	5	5						

## I.—STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1876.		Received during Year.		Carbonized or Used during Year.		In Store, Dec. 31, 1877.	
	Tons.	Cwt.	Tons.	Cwt.	Tons.	Cwt.	Tons.	Cwt.
Common . . . . .	41,221	5	275,181	5	285,008	1	31,394	9
Cannel . . . . .	613	9	5,097	19	4,244	19	1,376	9

## K.—STATEMENT OF RESIDUAL PRODUCTS.

Description of Residual.	In Store, Dec. 31, 1876 (estimated).		Made during Year (estimated).		Used in Manufacture during Year (estimated).		Sold during Year.		In Store, Dec. 31, 1877.	
Coke—common, chaldrons of 36 bushels . . . . .	45,760		346,857		114,098		226,168		52,351	
Breeze—ditto . . . . .	4,364		21,010		4,338		15,025		6,011	
Tar—gallons . . . . .	80,200		3,455,593		7,486		3,362,890		165,417	
Ammoniacal liquor—batts of 103 gallons . . . . .	2,163		93,470		..		92,815		2,788	

Mr. MARRIS moved the adoption of the report of the Committee, and, in doing so, remarked that against the falling off in the consumption they had the annuity of £1300 from Walsall. Another circumstance also was that the last quarter was technically three days shorter than in the corresponding quarter of the previous year, owing to the accounts being got out quickly; so that they must add to the return the amount of gas that would have been consumed, and that would have made an increase as nearly as possible of one per cent. He attributed the decrease of consumption to the fact that there had not been so much consumed in the manufactories, owing to the badness of trade. As to the decrease in the sale of coke, every exertion had been made by the Committee to sell it, and to promote its consumption for domestic purposes. There was a great reduction in the price which it realized, being about 1s. 5d. per ton less than in 1876. In 1875 he found that the amount realized by the sale of coke was £87,754, against £55,868 last year. This diminution had arisen from causes over which the Committee had no control whatever. To show their increased power of production, he mentioned that while in 1875 the maximum power of production at the works was 15,029,000 cubic feet per day, in 1877 it was 16,416,000. With regard to the profits, he explained that the circumstances of the times had blocked them, and when trade improved they hoped the Gas Committee would reap the advantage.

Mr. AUSTIN inquired whether the Committee had anything to report with regard to the question of giving up a piece of land for a recreation park for the inhabitants of Duddleston and Nechells.

Mr. BEARD said that if the motion was intended as an approval of the efforts of the Committee to make the best of the works, then he agreed with it; but if it was intended to approve the results obtained, then he did not agree with it, and he thought he should be able to show that a more significant failure to obtain prophesied results was never exhibited. The fact that it had been necessary to spend so large a sum of money in repairs—a sum which had been taken from the money gained by the decrease in the price of coal—only proved what an "old tin-pot concern" they had purchased, and what a lot it cost to put it in order. That money ought to have been devoted to the reduction of the price of the gas to the consumers, instead of being expended in the improvement of the works. With regard to the standard of light, he held that, although the gas was good, it was not so good in point of quality by, at least, 1½ candles, as that supplied by the Companies when they sold at the low rate. He referred to the results achieved at Wolverhampton and Manchester, and again complained that all the advantages that were being derived from cheap coal were going in repairs to the works.

Alderman AVERY said the views of Mr. Beard were very startling, singularly novel, and had this inexpressible charm—that the orator evidently believed them to be true. Reference had been made to the quality and price of gas at Manchester; but if Manchester had acted on such views as those propounded by Mr. Beard and his friends, instead of charging 3s., they would, in all probability, be charging 4s. Manchester, instead of purchasing the gas-works at a maximum price—averaging 7, 8, or 9 per cent. on the capital employed—was sagacious enough, 30 or 40 years ago, to obtain the works at cost price. Mr. Beard had told them that the Birmingham undertaking was a significant failure, as compared with the prophesied results. Mr. Beard must have meant a significant failure of all the prophecies he had made; because, as nearly as he could remember, the calculations of Alderman Chamberlain in recommending the purchase were precisely, or nearly precisely, realized by the results. In two years the Gas Committee handed over to the general funds of the Corporation, for the reduction of the rates, no less than £55,000; yet Mr. Beard said the undertaking was an "old tin-pot concern." It was precisely the kind of tin-pot concern that he (Alderman Avery) would like to purchase. On the whole, he believed that the Gas Committee had reasonable cause for satisfaction in their long, painstaking, and indefatigable labours. The Council and the public had reason to rejoice that the purchase had been made. He believed that they possessed a property that was not an old tin-pot, but a good solid property, increasing in value year by year; and it had been so prosperous in the past that he had no doubt that, under the able management of the Gas Committee, it would prove more prosperous still.

Alderman BRINSLEY said that Alderman Avery had tried hard to draw a red herring across the path of the Council and the public, but he had not answered the figures. When coal was the price that it was at the present time, gas was being sold in Birmingham at 2s. 3d. per 1000 feet, giving a profit, according to Mr. Beard's figures, of something like £44,000. Then the small consumers were paying 2s. 7d., now they were charged 3s. 3d., giving another £20,000. If Alderman Avery had told the Council what had been done with this £64,000, he would have done the ratepayers a service.

Mr. R. CHAMBERLAIN said the Council would hardly expect that Mr. Beard's time-honoured wail should be answered over and over again. He thought the Council were already satisfied that the Gas Committee were carrying out what was stated by Alderman Chamberlain when the purchase was effected. He suggested that Mr. Beard, in coming forward as he did upon the presentation of every Gas Committee's report, should at least devote a little more study to the accounts before he made his complaints.

Alderman HEATON said he felt bound to support the Gas Committee, especially with regard to the question of coke. He assured the Council that a price at least 25 per cent. lower than it should be was now being paid for coke.

Mr. MARRIS, in replying, declined to follow Mr. Beard in his figures. Mr. Beard might remember, with advantage to himself and to the dignity of the Council, that he was a large ratepayer in a parish which was seeking to purchase part of the gas undertaking from the Birmingham Corporation; and as Mr. Beard's interests and those of the district of Smethwick were thus, to some extent, bound up, it would be well if Mr. Beard explained whether he was speaking as a ratepayer of Birmingham or a ratepayer of Smethwick. The Council had heard Mr. Beard's figures again and again; they had expressed an opinion of them, and manifested some degree of impatience in answering those figures; therefore, with the permission of the Council, he would now pass them by. With regard to the illuminating power of the gas, he had simply to say that the Inspector stated that since he had had the testing he had had very high results during the past year. Replying to Mr. Austin, Mr. Marris stated that there were difficulties in the way of granting the piece of land in question. A portion of ground at Saltley might be fenced off and thrown open, but it would be a comparatively small piece, and the ratepayers might be deprived of its enjoyment at any time.

Mr. BEARD explained that he had spoken as the representative of his constituents, and at the request of several large ratepayers.

The report was then approved.

## GAS AFFAIRS AT BLACKBURN.

The Blackburn Borough Gas, Water, and Extension Act, 1877, scheduled an agreement which had been come to between the Corporation of Blackburn and the Gas Company of the town, for the transfer of the undertaking of the Company to the Town Council, on terms therein set forth, and sanctioned by Parliament. By that arrangement the works were to be absolutely transferred to the Corporation as from the 1st of January, 1878, the Company carrying on the business during the whole of 1877, as trustees for the Corporation, receiving out of the profits full maximum dividends on all classes of shares for the first six months, and being paid by the Corporation the first half-yearly instalment of the settled annuities for the second six months ending at Christmas last; they being entitled also to retain one-half of the reserve-fund shown by the balance-sheet at the period of the transfer.

Mr. S. R. OGDEN, the Engineer and Manager of the Company, who is also acting in the same capacities for the Corporation, has just published his report and balance-sheet for last year. In the former he says:

To the Chairman and Members of the Gas Committee.

Gentlemen,—I have the honour to lay before you the accompanying statement of the operations of the gas-works for the year ending Dec. 31, 1877, and I trust you will find the same satisfactory and encouraging.

You will be pleased to learn that the No. 2 works are in excellent working order, and consequently will require little money being expended upon them during the ensuing year.



So far as regards the No. 1 works, some outlay will be necessary, as the old bench will have to be pulled down and replaced with a new one, but the total cost will not be more than £400.

It is with considerable satisfaction that I draw your careful attention to the accompanying working statement, which would have been even more favourable had the price of coke not been so very low during the past year.

(Signed) SAMUEL R. OGDEN, Engineer and Manager.

*Working Statement for the Year ending Dec. 31, 1877.*

Gas made, as per station-meter . . . . .	315,091,000 cubic feet.
Gas sold to private consumers . . . . .	271,592,400 cubic feet.
Gas sold for public lighting . . . . .	13,988,500 "
Gas used on the works . . . . .	2,822,100 "
	288,403,000 "
Unaccounted for . . . . .	26,688,000 cubic feet.

Or 8·4 per cent.

Capital employed—	
Share capital . . . . .	£238,035 0 0
Loan ditto . . . . .	31,870 0 0

Total . . . . . £269,905 0 0 or £9 5s. 1½d. per ton, or 18s. 10½d. per 1000 feet sold.

Coal carbonized—	
Common . . . . .	23,891 tons = 81·93 per cent.
Cannel . . . . .	5,267 " = 18·07 "
	29,158 tons.

Illuminating power required by Act . . . . .	None.
Illuminating power supplied . . . . .	17 candles.
Gas made . . . . .	315,091,000 cubic feet.
Gas made per ton . . . . .	10,806 "
Gas sold . . . . .	285,580,900 "
Gas sold per ton . . . . .	9,794 "
Gas sold, per cent. on make . . . . .	90·6 per cent.
Used at works and offices . . . . .	2,822,100 cubic feet.
Used at works and offices, per cent. on make . . . . .	89 per cent.
Gas unaccounted for . . . . .	26,688,000 cubic feet.
Gas unaccounted for, per cent. on make . . . . .	8·4 per cent.
Coke made . . . . .	21,500 tons.
Coke used for fuel . . . . .	10,367 "
Coke used for fuel, per cent. on make . . . . .	48·00 per cent.
Average price of coke sold . . . . .	5s. 5d. per ton.
Tar made, 1615 tons = at 200 gallons per ton . . . . .	323,000 gallons.
Tar made per ton of coals . . . . .	11 "
Average price of tar per gallon . . . . .	2½d.
Liquor made, 2952 tons = at 230 gallons per ton . . . . .	678,960 gallons.
Liquor made per ton of coals . . . . .	23 "
Average price of liquor per 1000 gallons . . . . .	43s. 3½d.
Net proceeds of coke and other residuals, per cent. on cost of coal . . . . .	35·06 per cent.

	£	s.	d.	Cost per 1000 Cubic Feet Sold.	Cost per Ton of Coal Carbonized.
Coal . . . . .	—	—	—	—	—
Less residuals—	—	—	—	—	—
Coke . . . . .	2,914	17	11½	2·44	1 11·99
Tar . . . . .	3,062	19	6½	2·58	2 1·21
Liquor . . . . .	1,469	10	7	1·23	1 0·09
	7,447	8	1	6·25	5 1·29
Net for coal . . . . .	13,792	8	5	11·59	5 3·32
Purifying . . . . .	720	14	11	0·61	5·93
Salaries of Engineer, Foremen, &c. . . . .	1,029	11	3	0·87	8·47
Wages at works . . . . .	4,643	13	9	3·90	2 2·24
Repairs and maintenance of works . . . . .	3,879	15	1	3·27	2 7·94
Salaries of Meter Inspectors . . . . .	571	3	3	0·48	4·70
Repairs of mains and services . . . . .	1,193	1	2	1·00	9·82
Repairing, renewing, and refitting meters . . . . .	1,865	13	1	1·56	1 3·26
Rents . . . . .	492	3	5	0·41	4·05
Rates and taxes . . . . .	3,497	1	9	2·94	2 4·79
Directors' allowances . . . . .	216	13	4	0·18	1·78
Salaries of Secretary and Office Clerks . . . . .	552	16	5	0·46	4·55
Collectors' salaries . . . . .	335	0	0	0·30	2·92
Stationery and printing . . . . .	96	17	11	0·08	0·80
General establishment charges . . . . .	567	5	8	0·47	4·66
Auditors' fees . . . . .	40	0	0	0·03	0·33
Law . . . . .	91	10	0	0·08	0·75
Bad debts . . . . .	102	19	8	0·09	0·85
Coal for offices, blacksmiths . . . . .	281	13	4	0·24	2·32
Total working expenses . . . . .	20,199	16	0	16·97	13 10 26
Coal and working expenses, less residuals . . . . .	33,992	4	5	28·56	23 3 78
Rental . . . . .	52,722	3	0	44·30	—
Public lighting . . . . .	2,175	19	8	1·82	—
Total rental and lamps . . . . .	54,898	15	6½	46·12	37 7 80
Profit on gas manufacture . . . . .	20,906	11	1½	17·56	14 4 02

*Summary.*

Profit on gas manufacture, as per above statement . . . . .	£20,906 11 1½
Less not included in the above—	
Repairing cottage, &c. . . . .	492 1 7
	£20,414 9 6½
Add not included in the above—	
Rental of meters . . . . .	£1637 1 10
Rents . . . . .	303 13 6
Directors' . . . . .	81 6 5½
Interest on calls . . . . .	7 0 3
Surpluses—receipts . . . . .	523 14 2½
Profit on meters sold . . . . .	21 19 2
	2,677 15 5
Profit, as per balance-sheet . . . . .	£23,092 4 11½

The balance-sheet of the Company shows that the receipts on capital account to the end of 1877 were—on shares, £238,035; and on mortgages, £31,870—total, £269,905. The whole of which had been expended, except a small sum of £762 5s. 10d. The reserve-fund on the 31st of December, 1877, amounted to £6449 18s. 11d., out of which £1937 11s. 11d. was paid for re-sheeting gasholder, leaving a balance of £4512 7s., which was equally divided between the Corporation and the Company.

BROMYARD GAS COMPANY.—The annual meeting was held on the 21st ult. The balance-sheet presented for the past year showed a balance in hand of £86 8s. 3d., and a reserve-fund of £135 14s. 11d. The Directors recommended a dividend of 7½ per cent.

**LEICESTER GAS COMPANY.**

The Ordinary Half-Yearly Meeting of this Company was held on Friday, the 1st inst.—Mr. W. E. HUTCHINSON in the chair.

The SECRETARY (Mr. W. Billson) read the following report:—

The Directors herewith present to the Proprietors the half-yearly statement of the capital and revenue accounts of the Company to Dec. 31, 1877.

Notwithstanding the reduction in price of 2d. per 1000 cubic feet, the gas and meter rental for the half year shows an increase over that of the corresponding half year of 1876, of £831 8s. 6d. The balance of the credit of revenue is £12,140 10s. 9d., which will suffice to pay the maximum dividends allowed by law, and to leave a sum to be carried forward.

The Company's dividends are now regulated by the clause of the Act of 1877, commonly known as the "Sliding Scale Clause," and the statutory dividends which the Company may pay in respect of the half year ending the 31st of December last, are as follows:—On the A shares 13s. 1½d. each; on the B shares 8s. 9d., each; and on the C shares 8s. 3d. each.

The Directors have made considerable progress in the arrangements for the erection of the new station on the Aylestone Road. Contracts have been entered into for the formation of two tanks of large size, for a gasholder capable of holding 1½ million cubic feet of gas, the foundations for retort-houses, and other necessary buildings, and for the laying of a large main into the town. The total amount of these contracts will exceed £60,000. Good progress is made by the contractors with the various works, and the Directors believe that when completed they will prove satisfactory to those who at that time may be under the obligation to manufacture and supply gas to the town and neighbourhood.

The Directors are promoting, in conjunction with the Corporation of Leicester, a Bill in the present Session of Parliament, for carrying out the arrangements made for the transfer of the undertaking to that body. The Bill has been read a second time in the House of Lords, and will probably not be opposed. It will be necessary at an early date to call you together to testify your approval of such Bill.

The Auditor who retires by rotation is Mr. Arthur Malin, and he is eligible for re-election.

The CHAIRMAN moved the adoption of the report, and said that it and the statement of accounts just read would show that the result of the business of the Company for the half year ending the 31st of December last had been highly satisfactory. The accounts showed that the consumption of gas had been largely increased, and the profits had been considerably increased as well. Notwithstanding the depression of trade in the town, and that the price of gas in the half year ending with 1876 was 2d. per 1000 cubic feet higher than it had been during the half year under consideration, the accounts showed increased receipts of between £800 and £900. This, he thought, would be deemed a very satisfactory result by the Shareholders. The capital account showed that the whole of the share capital, authorized by the Acts of Parliament previous to the last, had been raised and fully paid up. They had at the end of the year no loans running, they having all been paid off, so that their borrowing powers under their several Acts of Parliament, amounting in the whole to £55,000, were available for the capital purposes of the Company. The accounts showed that they had added to their previous expenditure £1784. There had been £546 paid for new manufacturing plant and new mains, and the expense of laying them had been £1880. The plant yearly and half yearly showed a considerable increase. New neighbourhoods sprung up, houses were built and streets formed, and they had, of course, to lay mains to supply the houses with gas, while new meters also increased in number from time to time. The parliamentary expenses, amounting to £1242, would seem to them a rather large item; but they would remember that when they deposited their Bill, they were met with a very powerful opposition on the part of the authorities of the town, and it became necessary that they should engage the best gentlemen that could be got for legal advice, and for scientific advice also. Every preparation was made to meet the allegations that were urged against the proposed works by the promoters of the petition against the Bill, when negotiations were entered into which resulted in terms being arranged by which the works should be handed over to the Town Council. This amount, though large, was absolutely necessary to spend for the protection of their interests. In the revenue account, on the credit side, there was not much to be remarked upon. The decrease in the price of coals had enabled the Directors to make a considerable reduction in the expenditure—something upwards of £1000. On the credit side, the increase in the demand for gas had given them a larger revenue, so that they were enabled to propose a slightly increased dividend. The report told them how it had arisen that they were now under the Act of 1877, and subject to the sliding scale. This Act had worked hitherto very much in their favour, so that they could give the Shareholders an increased dividend, and still carry forward a considerable amount to the current half year. He was happy to tell them that the works on the old site, near Belgrave Road, had been maintained in good order and condition during the half year. With respect to the works on the Aylestone Road, he supposed most of the Shareholders had walked in that direction and witnessed the very busy scene which the works presented. The large and continued increase of the town and neighbourhood had compelled the erection of these new works, so as to give them the means of supplying the town and neighbourhood with gas. Two large tanks had been commenced by responsible contractors, and a large gasholder, capable of storing one million and a half cubic feet, had also been contracted for, and the foundations of retort-houses and other necessities for the manufacture of gas were now in course of construction. They had contracted also for several large mains to connect the new works with the town, and they hoped that, in the course of a year, they would be able to use the gasholder. The contracts amounted to upwards of £60,000, and in order to provide the means of payment, they had, since the close of the year, according to an arrangement with a Committee of the Town Council, borrowed some money on the best terms they could get, and they had also begun the year with a balance of £5000 on the old share capital. The Act of last year gave them power to raise a very large sum, both in shares and also by increased borrowing powers, but by their arrangement with the Town Council, pending the passing of the present Bill, they were under an engagement not to raise that capital or borrow money to carry on the works. The Bill now before Parliament was not likely to be opposed, and, as its provisions would have to be submitted to the Shareholders at a special meeting convened for the purpose, he need not enter into the matter now. The dividend proposed by the Directors spoke for itself, and he had generally found that good dividends did not require long speeches.

Mr. FRISBY seconded the motion, which was carried unanimously, and the retiring Auditor having been re-elected,

Mr. I. HART proposed a vote of thanks to the Chairman. This was seconded by Mr. A. M'ALL, and carried.

The CHAIRMAN, in reply, said they would not have many more meetings in connection with the Company, but he thought the position in which they would leave the undertaking would be creditable both to the Company and to the Town Council, into whose hands it was likely to fall.

The proceedings then terminated.

TODMORDEN GAS COMPANY.—At a meeting of Shareholders, on the 13th ult.—Mr. A. Ormeroyd in the chair—it was resolved to increase the capital of the Company by the issue of new shares to the amount authorized by the Company's special Act of 1870, which will make the total share capital of the Company £14,000.



DOVER GASLIGHT COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held on Tuesday, the 5th inst.—W. R. MOWLL, Esq., in the chair.

The SECRETARY (Mr. G. Fielding) read the notice convening the meeting, and the following report of the Directors was presented:—

We have much pleasure in laying before you our report for the past half year. The quantity of gas made and sold has been greater than in any former period of similar duration, having amounted to 49,386,400 cubic feet, as compared with 46,181,600 cubic feet in the corresponding period of the preceding year.

We entered last summer into a contract for the supply of 19,000 tons of coal upon very advantageous terms, and filled our stores while freights were at their lowest rates; this has enabled us to manufacture gas under very favourable conditions as to cost.

The contract with the Town Council for lighting the public lamps expired on the 31st of December. We have renewed that contract for another period of three years at a saving to the town of upwards of £250 per annum.

So soon as we had practically proved that we could do it without prejudice to your interests, we gave notice to the consumers that the net price of gas would, during the current half year, be reduced to 3s. 9d., per 1000 feet, and we cherish the hope that this reduction will give general satisfaction as well as further encourage the consumption of gas.

Having now had the opportunity of ascertaining the amount of time, labour, and responsibility which will devolve upon the Board of Directors and Secretary in respect of the management of your business, and the results of that business as shown by the profit and loss account, and having considered the information and advice given us by our Consulting Engineer, as to the fees and salaries paid in Companies similarly circumstanced, we recommend that the sum to be divided in fees by your Directors should be fixed at £300 per annum, and the salary of the Secretary at £200 per annum; the proportionate parts of these salaries are charged in the accompanying accounts for the past half year, subject to your approval and adoption.

We also recommend that the salary of the Auditors should in future be at the rate of £31 10s. per annum.

We sold by auction on the 24th of December, 270 of the new shares created at the Special Meeting on the 13th of that month, which produced an average price of £15 6s. 6d. per share.

As the result of the first half year's working under the personal conduct of your Directors, we propose the declaration of the maximum parliamentary dividend at the rate of 7½ per cent. per annum, and the carrying to a reserve-fund of £870 17s. 3d. which we have invested in Consols.

In consequence of the manufacture being now carried on by the Company, the accounts are made up in a form different to that in which they have heretofore been presented to you.

Dr.—Profit and Loss Account, for the Half Year ending Dec. 31, 1877.

To Coals	£1,261 14 4
Purifying	121 6 0
Repair and maintenance of works, meters, mains, &c.	1,605 14 0
Wages, &c., gas-making	726 9 11
Lamps—providing, lighting, extinguishing, cleaning, and repairing.	351 6 4
Rents, rates, and taxes	422 6 3
Salaries, Collector's commission, and Directors	768 3 10
Interest on loans	352 13 2
Incidental expenses	120 10 7
Valuation, expenses of auction sale of shares, &c.	268 2 10
Alterations and improvements	728 4 9
Balance for investment on account of reserve-fund	870 17 3
Dividends payable March, 1878	1,972 18 4
	£12,570 7 7

Cr.—Profit and Loss Account.

By Sale of gas, less discounts and bad debts	£10,076 19 7
Coke, tar, and other residuals	2,125 9 9
Meters and fittings, rentals	245 13 4
Profits on gas-fittings and asphaltum	116 17 5
Seep for new shares.	5 7 6
	£12,570 7 7

Dr.—Balance-Sheet.

To Capital raised	£53,860 0 0
Statutory mortgages	10,000 0 0
Premiums on new shares	5,423 3 7
Balances of profit accounts from last half year	£2032 5 5
	4089 14 7
	£6,122 0 0
Less rectification of discounts	£12 15 5
Less dividend declared and fees voted Sept. 4, 1877.	2181 5 0
	2134 0 5
	3,927 19 7
Deposits from consumers	256 1 10
Sundry liabilities	5,979 12 11
Bills payable	714 4 5
Balance	2,843 15 7
	£83,004 17 11

Cr.—Balance-Sheet.

By Cost of works to June 30, 1877	£71,678 9 4
Less depreciation	7,314 3 7
	£64,364 5 9
Extensions paid for during the half year	1,006 6 6
Book debts	8,785 4 5
Coals, coke, sundry stocks, and plant	6,634 5 6
Bankers	2,214 15 9
	£83,004 17 11

The CHAIRMAN said it had been their custom to take the report as read, and they would do so on this occasion; and having said this much, he should consider that he was best consulting his own feelings if he simply moved its adoption, without uttering a single word. From a variety of circumstances, all of which had combined to the prosperity of the Company, the report before them was, to his mind, so exceedingly satisfactory that it needed no words of commendation from him; but as they had met together under exceptional circumstances—it being the first half year that the works had been under the Directors—he would shortly refer to the past history of the Company. It appeared, on looking at the books, that in the year 1860 the consumption of gas in Dover was, in round numbers, 40 million cubic feet; in 1865 it had risen to 62 millions; in the year 1870 it had again risen to 76 millions; and, although not in the habit of seeing what was the growth of other Gas Companies, he was not going beyond the truth if he said that the extension of the business of their Company, as shown by the figures in the report, was very much beyond what was usual. Some persons would be disposed to say that this extension followed, as a matter of course, as the town grew larger; but, inasmuch as their duty was to give honour to whom honour was due, he had much pleasure in stating that, while some of this extension was due to the town growing larger, and the customers of the Company, therefore, increasing, still more was it due to what he would call the untiring energy and persevering zeal which the late lessees of the works brought to bear upon the Company's business interests during the time of their lease. In the year 1860 the Shareholders only received 6 per cent. upon their capital invested, and that state of things went on up to August, 1872, when, owing to the extraordinary increase of the business of the Company, the Shareholders received an extra half per cent.; and this rate of 6½ per cent. was continued to the end of 1874. During this period circumstances

arose which necessitated alterations, and if just now he said that credit was due to Messrs. Anderson and Jones for the energy displayed in the conduct of the works, he now said that inasmuch as from the commencement of the year 1875 they received 7½ per cent., the increase of one per cent. was entirely due to the policy which was projected by the Directors and admitted by Messrs. Anderson and Jones. Up to 1874 the premiums received on the sale of shares amounted, he might almost say, to nil—he believed it was something like £149. But when the Company began to pay 7 per cent., and people began to see that very probably 7 per cent. would be the standing dividend of the Company, investors entered into competition for shares, and raised the premium upwards of 50 per cent. That premium the Company had continued to maintain up to the present moment, and the result of it was that they had now received premiums amounting to £5,423 3s. 7d. He need not stop to tell any man of business that it was an immense advantage to any existing Company when really they could, by their prosperity, get more than 30s. of the public money for simply 20s. of the coin of the Company. In the year 1876 he found the consumption of gas in the town had reached 89 millions, and, during the past year it had reached the grand quantity of 95 millions. Now, while all this was going on, the Company were able every half year to put by upon an average £330 or £440 as a depreciation-fund, and something between £100 and £200 as surplus profits, and these sums now amounted to £6122. They had the money really to the good, and they paid the full dividend they were entitled to pay under their parliamentary powers; and, in addition to this, with reference to the last half year, they would see by the statement that, instead of getting only some £400 or £500 to the good, as they were last year, they had £714 4s. 5d., which had been invested. The position was this, that so far as the Shareholders were concerned the goal had been reached at which Parliament said, "You must go no further." Therefore the Company were in a position to say to the Shareholders, "We have done for you, so far as profit and loss are concerned, all we can." And now they had to see in what direction their duty lay. It lay in the direction of looking after the interests of the consumers of gas and the ratepayers of Dover. They had had the subject under consideration during the last six months, and as soon as their Manager was able to tell them where they were the Directors intimated to the public that, after the 31st of January last, the price of gas would be reduced to 3s. 9d. But, in addition to this, they had also entered into a contract with the Local Board for three years, the terms of which would be an actual saving to the town of £250. Now that was a point which he thought it important to touch upon with some little persistency. It would be in the recollection of the Shareholders that, somewhere about last May, the Local Board issued advertisements for the supply of fuel for the water-works. It would also be in their recollection that the Company tendered to supply coke, guaranteeing that the quantity of coke, which they sent by the ton, should equal the work which would be done by the same quantity of Welsh coal, and that if the Board would only accept the tender there would be a saving to them of from £150 to £200. From what he had heard outside he was perfectly sure that the decision of the Local Board was to prejudice the real interests of the town and was a mistake. But the Directors were anxious that such a mistake should not be repeated. If the Local Board would say, "Very well, during the past year we have pumped so many million gallons of water into the upper reservoir, and so many into the lower reservoir, are you prepared to pump that water for us at the same cost during the coming year as it has cost us during the present?" He ventured to affirm, and his colleagues would agree with him, that they would say "Yes." Supposing they did that (he did not expect they would) they could make a contract with them. But they did not want any suzerainty from the Local Board; the Company were in the position of a man who could pay 20s. in the pound. If the offer had been accepted, instead of reducing the price of gas to 3s. 9d. per 1000 feet, it would have been 3s. 8d. But this they might say speaking as ratepayers, and as large ratepayers too, that the Local Board, as trustees of the rates, were bound to go into the cheapest and best market. Be this as it might, when the time came, he hoped they would again tender for coke at such a price as would make it evident to men competent to form an opinion that it would be an advantage to the Local Board to accept the tender for coke rather than coal. Now he came to the next point, and that was with reference to the amount of fees which the Directors thought they were entitled to. They took some considerable pains to ascertain what was the rule in other Companies, and they had not ventured to say, as a Board, that they ought to be paid better than anybody else, nor so well as anybody else, but had adopted the happy medium; and the result was that they suggested, for the approval of the Shareholders, that the fees of the Directors should be set at £300 per annum. The last matter was the salary of the Secretary, and here again they were disposed to think they might fairly have voted their esteemed Secretary £250 per annum; yet they thought, under all the circumstances, they would ask for £200, and he was glad to say Mr. Fielding was perfectly satisfied with it.

The motion for the adoption of the report, having been seconded by Mr. BOTTLE, was carried with only one dissentient.

Mr. BOTTLE proposed, and Mr. E. DRUCE seconded, a resolution that the fees of the Directors, as from the 1st of July last, should be £300 per annum.

This was agreed to, and the salary of the Auditor having been fixed at £31 10s. a year, the business of the meeting terminated.

FATAL ACCIDENT AT THE SHOREDITCH GAS-WORKS.—A sad accident occurred on Monday morning, March 4, at the Shoreditch Station of The Gaslight and Coke Company. Messrs. C. and W. Walker are erecting a large gasholder at this station, and one of their workmen, named Hawkes, who, with his father, was rivetting at the time, fell from the top girder of the guide frame to the bottom of the tank, a distance of nearly 120 feet, and was killed. In the fall the poor man came in contact with the edge of the side sheets, cutting one arm completely off. Mr. Clark, the Engineer, the Company's Surgeon, and also the Contractor's Manager, were promptly at the scene of the accident, but, of course, were of no avail; death must have been instantaneous. At the inquest on Wednesday last, the Jury returned a verdict of "Accidental death."

CUCKFIELD GAS COMPANY.—The Directors, in their annual report, congratulate the Shareholders on the favourable state of the finances. The consumption of gas for the year has fairly and steadily increased, while the cost of production has been somewhat less than usual. Last year the price of the gas was reduced, but, notwithstanding this, the Directors are enabled to recommend a dividend of 47 per cent. (free from income-tax), that a further sum of £50 be placed to the reserve-fund, raising that fund £354, and to carry forward a balance. Regret is expressed at the loss the Company have sustained by the death of the Treasurer, the Rev. T. A. Maberley. The revenue received for gas was £545 9s. 9d.; for lighting public lamps and town clock, £79 17s.; rent of meters, £42 3s. 7d.; sale of coke, tar, &c., £99 11s. 4d. The expenditure, which includes last year's dividend of 7s. 6d. per share (£162 10s.), and a balance of £25 0s. 10d. due to the Treasurer, amounted to £806 8s. The disposable balance for dividends this year is £201 12s. 3d. The property and assets of the Company amount to £3216 4s. 6d.



### REDHILL GAS COMPANY.

The Ordinary General Meeting was held on the 22nd ult., when the following report and statements of account were presented:—

Your Directors submit herewith the eighteenth annual balance-sheet, showing the financial position of the Company on the 31st of December last, and they have much pleasure in again reporting the favourable progress of your business.

The proposed reduction in the price of gas, referred to by your Directors in their last report, took effect on Jan. 1, 1877, and has been attended with success, the quantity of gas sold by the Company being considerably in excess of that disposed of in the previous year.

This encouraging result is, they believe, mainly attributable to the fact, that the reduction in price has induced a greater consumption for lighting, and has led to a more general use of gas for heating and cooking purposes; it is, moreover, gratifying to your Directors to feel that such may also be fairly taken as an indication of the progress and prosperity of the Borough of Reigate and the surrounding neighbourhood.

Application having been made by the Corporation of Reigate, to the Company, to lay mains for the purpose of supplying the public lamps about to be placed in the Garlands and Cromwell Roads, Redhill, your Directors, considering it desirable to comply with such request, are now taking steps for completing the necessary works.

The works, machinery, and plant of the Company have been maintained in an efficient state during the past year, and important renewals have been made therein, the entire cost of which, as appears by the balance-sheet, has been paid out of revenue.

Your Directors, availing themselves of the powers conferred on them by the last annual meeting, have issued 400 new shares of £5 each; these shares were offered for subscription at par amongst the Shareholders *pro rata*, and were at once applied for and allotted. A portion of the amount realized by this issue has been appropriated to the repayment of a loan of £1250 secured by debenture, and the residue has been expended in the improvement and extension of the plant, machinery, and mains, a step rendered absolutely necessary by the continuous increase in the business of the Company.

Further expenditure being requisite for these purposes, as also for the erection of additional holders, your Directors recommend that they be empowered to issue 1200 new shares of £5 each. It is not intended that this sum shall be immediately expended, but looking to past requirements, and the frequent demands for the extension of mains, they feel it desirable that they should be provided with the necessary power for obtaining funds from time to time as needed.

The balance-sheet shows a net profit of £2576 6s., out of which the Directors recommend that a dividend be declared on the paid-up capital of the Company, at the rate of 10 per cent. per annum, free of income-tax. An interim dividend of 4 per cent. was paid in September last, leaving 6 per cent. to be paid on the 1st of March next, and a balance to be carried forward of £190 9s. 6d. The guarantee-fund now amounts to £1881 15s. 4d.

The retiring Directors are Messrs. W. B. Waterlow and F. B. Hallowes, who are eligible, and offer themselves for re-election.

Revenue Account, for the Year ended Dec. 31, 1877.			Cr.		
Balance from last account.	£2,758 15 7		Stock on hand, Dec. 31, 1876.	£515 19 7	
Less dividends paid.	2,542 16 0		Coals	2,825 5 10	
			Lime	123 4 0	
	£215 19 7		Salaries	340 15 0	
Gas supplied	5,934 9 1		Renewals	525 5 5	
Coke, tar, lime, &c.	1,142 9 10		Wages and petty expenses	621 13 1	
Services	83 4 1		Tubes, fittings, &c.	103 1 5	
Transfer fees	0 10 0		Rates and taxes	136 2 1	
Interest on deposit	3 11 4		Stationery	28 8 5	
Old materials sold	25 5 7		Auditors fees	16 16 0	
Stock on hand—			Directors remuneration	200 0 0	
Coals	733 6 8		Interest on debentures	61 14 4	
Coke	89 10 0		Bad debts	5 1 8	
Fittings	57 1 8		Law expenses	5 15 0	
			Amounts written off—works		
			and buildings	200 0 0	
			Balance	2,576 6 0	
	£8,285 7 10			£8,285 7 10	

Capital Account.					
4700 shares, £5 each, fully paid up	£23,500 0 0		Freehold land	£371 10 4	
Amount received on 400 new shares, fully called up	1,982 10 0		Works and buildings	23,661 17 4	
Premium-fund	5 4 0		Meters & miscellaneous effects	1,083 19 11	
			Office furniture	70 0 0	
			Balance unexpended	300 6 9	
	£25,487 14 0			£25,487 14 0	

### EASTBOURNE GAS COMPANY.

The Half-Yearly Meeting was held on the 25th ult.—Dr. JEFFERY in the chair.

The report of the Directors was as follows:—

Since the last ordinary meeting of the Company the additional piece of land, contracted to be purchased of His Grace the Duke of Devonshire, as stated in the report laid before that meeting, has been conveyed to the Company, and Messrs. John Aird and Sons had nearly completed the new gasholder-tank referred to in such report, when an unfortunate accident occurred through the slipping of the ground, which totally destroyed the walls of the tank, and rendered it impossible to complete it. Several ineffectual attempts were made to obtain a better foundation, but the treacherous nature of the soil prevented this being accomplished, and it was finally determined to abandon the attempt, and to obtain a more favourable site. Application was accordingly made to His Grace the Duke of Devonshire, through Mr. Insoll, for a piece of land adjoining the Company's premises on the west, which met with a favourable reception, and eventually a piece containing 4 acres 3 roods 21 perches was purchased at £150 per acre, and Messrs. John Aird and Sons are now constructing a tank on the new site.

The 1000 additional B shares, authorized to be issued at the extraordinary meeting of the Company, held on the 27th of August last, were offered to, and taken up by, the existing Shareholders, and a call of £5 per share has been applied to the purposes of the capital of the Company, and that account shows a balance in its favour of £4846 1s. 1d.

The Local Board have come to the decision to burn by meter in all the public lamps, and have accordingly erected meter-lamps, throughout the town for that purpose. They have also undertaken the lighting, extinguishing, cleaning, and repairing the same, and the Directors trust that this arrangement will prove satisfactory to all parties concerned.

As the receipts on the revenue account are in excess of the corresponding period of last year, while the expenditure is less, the Directors feel that this will be considered a satisfactory proof of the prosperity of the Company. The assets and liabilities having been taken into account, there will be found to be a balance of £3480 4s. 5d. available for dividend, and the Directors recommend that a dividend at the rate of 7 per cent. per annum be declared and paid upon the £15,000 raised by the issue of 2000 B shares, and a dividend at the rate of 10 per cent. per annum upon the £20,000 original capital of the Company for the past half year, and a bonus of 6 per cent. upon the last-mentioned capital, which will clear off the balance payable to the Shareholders on account of the deficiencies of the dividends paid in former years since the incorporation of the Company, as provided for in the Company's Special Act, and the Acts incorporated therewith.

Should no unforeseen occurrence take place to affect their calculations, the Directors believe they will be in a position to reduce the price now charged for gas, and will recommend the Shareholders to reduce the price accordingly from 5s. to 4s. 7d. per 1000 cubic feet on and after the 1st of October next.

The Directors have a special report from their Engineer, stating that to meet the growing requirements of the Company on account of the increase in the demand for gas, it is necessary to extend the works considerably, and they will ask for power to raise further capital.

The CHAIRMAN, in moving the adoption of the report, referred to the accident to the gasholder-tank. He said the Directors had placed the construction of the work, as they had usually done with all works of magnitude, in the hands of their Engineer, Mr. Williams, who had constructed as many tanks as any Engineer in England. He prepared plans and specifications, the site selected being as near to the old tank as was possible. The work was nearly completed—in fact, it would not have taken more than a fortnight longer—when it suddenly collapsed through a landslip. There was one thing he might tell them, the site was not bored to see if it were sound; had that been done, the mishap would not have occurred, and if any blame rested on the Engineer it was that he had not

bored to ascertain of what the foundation consisted. They afterwards discovered that the old tank was erected in a natural basin, and the foundations for the new tank had been laid in the side of this basin, the result being that it gave way. The Contractors were a firm of good position, Messrs. Aird and Co., and they had met the Directors several times in a most friendly way, and he was pleased to say that the work was recommenced and now nearly completed. After the landslip, the Directors found themselves under the necessity of obtaining a fresh site, and for this they were obliged to look out for additional land. Through the kindness of the Duke of Devonshire, they were enabled to become the owners of five acres adjoining their other property, his Grace accepting the moderate price of £150 per acre. At the last extraordinary meeting, the Company decided to issue 1000 additional B shares, for the carrying out of extra works, but only half of that number had been issued, and they had in hand, on account of those issued, the sum of £4846 1s. 1d. As they were aware, the Local Board had erected meter lamps, and had undertaken their lighting and general management. For the future, therefore, any complaint of bad lighting would have to be made to the Local Board, not to the Gas Company. He had no doubt the alteration would be of benefit to the Company, as they would be paid for the amount of gas consumed, instead of so much per lamp, and he trusted that it would be equally beneficial to the town. He had already been informed that the lamps were not lighted for so many hours as formerly, but that was between the Ratepayers and the Local Board. The next question referred to the position of the Company, and he was pleased to say that it showed that a dividend of 7 per cent. could be paid on the B shares, and 10 per cent. on the ordinary stock, while a bonus at the rate of 6 per cent. for the half year was also recommended on the latter. This bonus cleared off the balance payable to the Shareholders on account of deficiencies in former years, and was the last they would receive, unless their dividend should in future years fall short, and they should afterwards have to recoup them. The next paragraph recommended that the price of gas, unless unforeseen circumstances should prevent it, would, after October next, be reduced 5d. per 1000 cubic feet. Upon this paragraph some writers in the newspapers had commented rather freely, and had afforded considerable amusement to the Directors. They had asked what unforeseen occurrence was referred to. He really did not know, and the Directors did not expect any to arise. They looked forward to making the reduction when the time arrived. Again, it had been asked why 5d. per 1000? To this he would say that it was because it was the decimal part. Formerly they charged 6s. 8d. per 1000, or 8d. per 100. Gradually they had reduced it, and they now proposed 4s. 7d., or 5d. per 100 feet. The Directors had the power to reduce the price without consulting the Shareholders, but they had always worked so harmoniously that they thought it right to consult them with reference to the proposed reduction. Writers in the papers had advised three months use of paraffin oil to coerce the Company. But the use of oil would not influence them. The Directors were looking after the interests of the Shareholders, but at the same time they were considering the public, and they had now recommended a reduction. There was one other question which had been raised, and that was the proposal of the Local Board to buy the interest of the Company, and on this he would remark that the Directors had retained the price of 5s. per 1000 feet until October, because if the Local Board bought their interest, then the amount they were receiving for gas would make a material difference in the value of the works. He did not, however, anticipate that the Local Board would become the purchasers.

Mr. HILLMAN seconded the motion, which was put and carried.

The meeting was then made special, for the purpose of considering the advisability of further increasing the capital of the Company.

The CHAIRMAN said that the Directors sought power to raise £10,000 for extra works by the issue of additional B shares. Their Engineer had made an examination of the works, and reported that the continued increase in the consumption of gas made it necessary that an additional retort-house and retorts should be built, all those in existence being in use. He also advised the extension of the purifying-house, and it was proposed to manufacture sulphate of ammonia on the premises, as it was stated that much larger profit would be made than by the sale of the residual. It was deemed advisable also to enlarge the main from the works of the town, as also those in other parts, and the £10,000 proposed to be issued with the £5000 remaining unissued, but the issue of which was sanctioned at the last extraordinary meeting, would, in the opinion of the Directors, be sufficient to complete the proposed works. This would make the capital of the Company £50,000—as much as it could be under the present Act—but the works would be thoroughly complete. He moved a formal resolution for carrying out the object.

Mr. HILLMAN seconded the motion, which was carried, and the meeting closed with the usual vote of thanks.

NARBOROUGH (LEICESTER) GAS COMPANY, LIMITED.—The annual meeting was held on the 21st ult.—Mr. J. Simpkin in the chair. In moving the adoption of the report, the Chairman congratulated the members upon the continued prosperity of the Company, and the steady increase of the business, for though the prices of gas and coke had both been reduced, the year's income had not been materially lessened thereby. The Directors recommended a dividend for the half year ended December 31, at the rate of 5 per cent. per annum, free of income-tax, and that 1 per cent. be added to the reserve-fund, which recommendations were unanimously adopted by the members present. The Directors had resolved to further reduce the price of gas 5d. per 1000 feet from and after March 31. The discount of 10d. per 1000 feet for payment in the month following the end of each respective quarter is to be continued.

LONGTON GAS COMPANY.—The half-yearly meeting was held on the 25th ult.—Mr. Webberley presiding. Mr. J. M. Darwin, the Company's Engineer and Secretary, presented the Directors report, which stated that, under the provisions of the Longton Corporation Gas Act, the purchase of the gas-works by the Corporation should be completed on or before the 23rd of February. With the consent of the Shareholders, however, the time might be extended to the 1st of September next. The profits of the past year were £2295 4s. 6d.; and the balance left, after payment of the previous half year's dividend, was £1124 15s. 10d. Those two sums amounted to £3420 0s. 4d.; and after payment of interest on mortgages, there remained a sum of £3342 5s. available for distribution, of which the half year's dividend would take up £1700, leaving £1642 5s. to be carried forward. The Directors recommended the payment of the usual dividends—viz., 10 per cent. per annum on the original shares, and 7 per cent. on the ordinary 7 per cent. shares, these dividends to be paid on the day of the meeting. The report having been adopted, the question of the completion of the gas-works purchase by the Corporation was brought forward. It was stated that the Corporation had decided to at once complete the purchase, when there would be a formal transfer of the works and undertaking to the Corporation upon the terms mutually agreed to. It was decided that the remaining money due to the Shareholders, under the final terms of the bargain, should be payable on the 5th of March. It was further decided that a sum of £750 should be placed to the credit of the Directors for appropriation amongst the officers of the Company.



SOUTH SHIELDS GAS COMPANY.

The Annual Meeting of Shareholders was held on Wednesday, Feb. 27—Mr. R. WALLIS in the chair.

The SECRETARY (Mr. J. H. Penney) read the notice convening the meeting, and the following report and statements of account were submitted:—

In presenting the report, with the balance-sheet and accounts of the Company, it will be perceived that the result for the year ending Dec. 31, 1877, is not so favourable as in former years. This arises chiefly from the large amount that has been spent out of revenue, during the past two years, for the repairs and maintenance of the works.

The increased make of gas and the steady progress of the rental, during the past year, are highly satisfactory. The Directors have to assure the Shareholders of the sound and prosperous state of the Company. In anticipation of an increase of the revenue for the present year, your Directors recommend an immediate reduction of 3d. per 1000 feet in the price of gas, making (with the deduction of the discount to the ordinary consumer) 3s. 1d. per 1000 feet.

During the year the Company sustained a great loss in the death of Mr. Henry Hewison, who for 30 years was a Director. His intelligence, his practical knowledge and ability, his courteous manners, and his accessibility to all classes of society, made him a most valuable acquisition to the Board. His colleagues wish to record their regret for his loss. Mr. John Robinson was appointed in his place.

The illuminating power of the gas has been (on the average for the year) above the standard required by Act of Parliament.

Your Directors retire from office at this meeting. They are all eligible for re-election and offer themselves accordingly.

Mr. John Ridley, the retiring Auditor, offers himself for re-election.

Dr. Half-Yearly Profit and Loss Account, ending Dec. 31, 1877.				Cr.	
Balance from June, 1877.	£2,719	9	5	Dividend on A stock	£1,800 0 0
				Do. B stock, and 1st and 2nd calls	905 16 1
				Balance carried down.	13 13 4
	£2,719	9	5		£2,719 9 5
Balance brought down	£13	13	4	Stock of coals, coke, tar, &c., from June	£1,952 18 9
Half year's gas and meter rental (net)	12,728	3	8	Coals and cartage	3,006 2 0
Sale of coke	1,190	2	4	Wages and superintendence	3,436 0 10
Ditto tar	629	14	10	Salaries (Office)	250 0 0
Profit on ammonia	653	15	10	Ditto (Collectors)	120 0 0
Corporation upholding public lamps	530	16	9	Rents	59 2 8
Service charges, fixing meters, &c.	109	1	2	Rates	443 17 10
Rents from property at Jarrow	12	10	3	Directors, Auditors, and Scrutineers fees	147 0 0
Stock of coals, coke, tar, iron, and sundries	1,809	18	3	Lime	191 15 8
Transfer fees	2	0	0	Water	53 10 5
				Retorts, bricks, &c.	5 19 10
				Service-pipes, gas-cocks, iron, steel, and tin goods	1,037 11 7
				Castings	55 12 4
				Cartage	196 18 4
				Paving	82 15 6
				Stationery, printing, &c.	82 9 1
				Incidentals and miscellaneous	349 6 10
				Paints, oils, &c.	148 17 8
				Wear and tear—maintaining and relaying mains, &c.	793 2 2
				Interest on loans, &c.	417 19 7
				New meters	170 0 4
				Repairing meters	29 13 10
				Bad debts	311 15 4
				Renewal of exhausters, and repairs of gasholders & purifiers	746 8 3
					£14,991 18 10
				Balance to profit	2,687 17 7
	£17,679	16	5		£17,679 16 5

Balance-Sheet.

Proprietors capital—				Plant, works, &c., as per last statement	£62,882 0 2
A stock	£40,000	0	0	Extensions and relay of mains during half year	540 10 11
B "	20,000	0	0	T. Stainton and Son, on account of scrubbers	26 8 0
New	7,990	0	0		£63,448 19 1
Loan capital, mortgages, and bonds	19,800	0	0	Less wear and tear—maintaining and relaying mains, &c.	793 2 2
Revenue account, balance of profit	2,687	17	7		£62,655 16 11
Sundry accounts owing for coals, lime, iron goods, &c.	3,836	14	2	New works in progress at Jarrow	20,566 10 1
Deposits for gas	1,024	16	5	Horses and carts	£810 9 6
Reserve-fund	6,276	1	7	Less profit	356 10 4
Dividend on £5811 13s. 3d., invested in 3 per cent. Consols	92	10	2		453 19 2
Balance due to bankers	418	1	11	Stock of horses food	10 8 10
				Ditto coals, coke, tar, &c.	1,809 18 3
				Bills receivable	8 18 8
				Consumers gas accounts, inclusive of quarter due Dec. 31	9,682 18 3
				Reserve-fund, invested in 3 per cent. Consols	5,311 15 3
				Sundry accounts owing for coke, tar, &c.	1,100 3 0
				Cash in hand	25 13 5
	£102,126	1	10		£102,126 1 10

The CHAIRMAN moved that the report and accounts be received and adopted, and in doing so said the past year had been a very important one in the affairs of the Company. The Jarrow works had progressed so far that they could say they were in a position to supply the whole of Jarrow and district with an unlimited supply of gas. They, however, found that, looking to the future, the site of their Jarrow works was fully small to meet their requirements, and the Directors had purchased of Messrs. Joicey a property close to their present works—possessing a very large river frontage—for the sum of £7500. It was a very valuable property, and, being near their own works, it was especially so; and, although they might not require it for two or three years, it would have been the greatest oversight if the Company had neglected the opportunity of securing for themselves so valuable a site. It would be found useful both for taking in coals and other material into their works, and also for the shipment of residual products from their works. Of course, the property he referred to would be unremunerative for a year or two, but it would be found of great value afterwards. Considering what they had done at Jarrow, there would not be for 10 or 15 years to come any further requirements for that district. With respect to the tanks at South Shields, they were progressing most favourably, and, as he had remarked on two or three occasions from the chair, they were spending a great deal in repairing them. They had now gone thoroughly over them, and examined them in every detail, and he was glad to state that they were in a most efficient state of repair, and they might safely look to a very large decrease in their expenditure for the next few years. The progress of the Company was perfectly satisfactory—the receipts for the past year amounting to £17,679 16s. 5d., and the disbursements to £14,991 18s. 10d., leaving a balance to profit of £2687 17s. 7d. This balance was not sufficient to pay the half year's dividend, there being a deficiency of £38 11s. 8d., which, however, they could draw from their reserve-fund. In the face of

this, the Directors came before the meeting with a proposal to make a still further reduction. The Shareholders might ask why they did this, in the face of their not meeting their dividend; but, as he stated, their works were in a thorough state of repair, very little more being required for some time; they therefore saw their way to a very large increase of revenue to meet the 3d. reduction which they now advised them to agree to, and which would amount to £1500. Beside their works being in a perfect state of repair, they had made very advantageous coal contracts, and which had been secured at 1s. 6d. per ton cheaper than they did last year; but they must bear in mind that the price of coal ruled the price of residual products, so that, while they had paid less for their coals, they would receive less for the coke. In order to make up for this reduction of 3d. per 1000 cubic feet, they looked forward to an increased consumption of gas. During the past year, in the consumption of gas, there had been an increase of 7,271,700 feet as compared with 1876. This was equal to £925, and he thought they might safely reckon on a further increase in that direction. The number of new services which they had put in during the past year had been 450; and if they had anything like the increase of new services this year, they would have every reason to be liberal with the public in reducing the price of gas. The highest net price for gas, deducting the discount, was 8s. 1d., and their lowest net price 2s. 8d.; and he believed this would bear a most favourable comparison with any other Company in the kingdom. The illuminating power of the gas had been, on the average, 15·2 candles, which was 1·2 candles above the standard required by their Act. In conclusion, the Chairman referred to the recent Gas Exhibition at South Shields, which had been attended with beneficial results, and said that it was intended to hold a similar exhibition at Stockton-upon-Tees.

Mr. J. RIDLEY seconded the motion, which was agreed to.

Mr. J. L. HALL said he had to move a resolution which was generally proposed by his friend Mr. W. Anderson, one of the senior Directors, whose absence he regretted exceedingly that day. It was that a dividend at the rate of 4½ per cent. on the A stock, and 3½ per cent. on the B and New stock be declared for the half year. It certainly did seem strange for the Chairman to recommend a reduction in the price of gas when they had not sufficient money to pay dividends, but he could bear testimony to the Chairman's statement that the works were in a thorough state of efficiency at the present time.

Mr. J. ROBINSON seconded the proposition, which was put and carried.

Mr. H. T. DUNCAN proposed that a reduction be made in the price of gas at the rate of 3d. per 1000 cubic feet, such reduction to take effect from the beginning of the year.

Mr. J. BOWMAN seconded the motion, which was carried unanimously.

Alderman DALE moved a vote of thanks to the Directors for their continued attention to the interests of the Shareholders during the past half year.

Mr. OLIVER seconded the motion, which was agreed to.

Mr. J. HENDERSON returned thanks on behalf of himself and his brother Directors.

The following Directors were re-appointed:—Messrs. R. Wallis, H. Nelson, J. Henderson, J. Robinson, W. Anderson, J. L. Hall, and J. F. Armstrong. Mr. J. Ridley was re-elected as an Auditor.

Alderman GLOVER proposed a vote of thanks to the Chairman for his valuable services for the good of the Company.

Mr. WATSON seconded the proposition, which was agreed to.

The CHAIRMAN, in acknowledging the compliment which had been paid him, regretted the decease of his friend, Mr. Henry Hewison, whose services were most valuable as a Director.

The meeting then terminated.

WALSALL GAS SUPPLY.—At the usual monthly meeting of the Walsall Town Council, held on Monday, the 4th inst., the Auditor presented a report, from which it appeared that the sales of gas to private consumers in the quarter ending Sept. 30, 1877, amounted to £2681 8s. 9d., as against £1725 13s. 10d. in the corresponding quarter of the previous year; but, inasmuch as the first figures included the sales previously made to the local customers of the Birmingham and Staffordshire Gas Company, it was impossible to make a comparison. For the same reason it was not possible to make a comparison of the year's sales. The net profit made during the year 1877 was £2929 4s. 7d. From this sum, however, by the Act of last session, interest on mortgage debts of the Old Improvement Commissioners (other than gas-works debts) had to be paid, leaving £1763 1s. 3d. as the amount by which the profit of the works exceeded the demands upon it. The total value of the works (old and new) was £86,519 14s. 10d., and the total of the loan debts £36,050, while £8080 was due to the Treasurer.

FERNDALE GAS COMPANY.—At the annual general meeting of this Company, on Thursday, the 7th inst.—Mr. W. J. Thomas in the chair—the following report was presented, and unanimously adopted:—"The Directors are again in the agreeable position of being able to congratulate the Shareholders on the result of the past year's operations. The balance appearing by the net revenue account allows the Directors to advise the declaration of a dividend for the twelve months ending the 31st of December last, at the rate of 5 per cent. per annum, free of income-tax, and payable on and after the 20th of March next. The Directors also recommend that £50 be set apart as the nucleus of a reserve-fund, to provide for any contingencies or necessities which may arise in the future. The Directors have, during 1877, taken advantage of the diminished rate of wages and reduced prices of iron and other materials, to make important additions to their buildings and carry out considerable extensions of their mains. A dwelling-house for the Manager has been erected on the Company's premises, which will effect not only an appreciable saving in rent but will also tend to secure a more thorough supervision of the works and stores. The gas-mains have been extended for a distance of about a mile and a quarter, to the rapidly growing suburb of South Ferndale, and it is anticipated that a remunerative revenue will soon result from this enterprise. These additions have involved an outlay of £533 19s. 5d., which was met by calling up the unpaid capital on shares previously created, and issuing 200 new shares and making a call of £1 per share thereon. These shares were distributed *pro rata* among the present Shareholders, by whom they were, it is satisfactory to state, most readily taken. The Directors, in continuance of the policy they adopted at the beginning of 1876, contemplate making a further concession to the Consumers by reducing, as from the commencement of the April quarter, the price of gas from 6s. 8d. per 1000 feet to 6s. This abatement is equivalent to 10 per cent., and it is to be hoped that the present Consumers will duly appreciate it, and that it will lead to a compensating increase in their numbers, and to such an augmented consumption as will encourage your Board in seeking to benefit your customers, while striving to earn for you a fair return upon the large capital you have invested. The Directors have, they believe, in every way studied to promote your best interests. They have endeavoured, so far as possible, to neutralize the result of the deplorable depression which has weighed down the trade of the district, by practising the most rigid economy consistent with the efficient maintenance of the works; and the report of Mr. J. L. Cocker, the Company's Engineer, will testify their excellent condition."



COLNE VALLEY WATER COMPANY.

The Eighth Ordinary General Meeting of the Shareholders was held at the Charing Cross Hotel on Wednesday, the 27th of February—General Sir E. W. FORESTIER WALKER, K.C.B., the Vice-Chairman, presiding.

The SECRETARY (Mr. Philip Verini) read the advertisement convening the meeting, and the following report was taken as read:—

The Directors have much pleasure in stating that, since the seventh ordinary meeting of this Company, held on the 24th of August last, the extensions to Edgware, the Hyde, Kingsbury, Mill Hill, and Highwood, besides several smaller extensions, have been completed, and the Company are now in a position to supply water in nearly the whole district included in the Colne Valley Water Company's Act.

The water-rates, which were stated in the last report to amount to nearly £1100, now exceed £2000 per annum, and as applications for water supplies are coming in almost daily, there is every hope that each half year's revenue account will show a considerable increase. Many other sources of income, such as watering roads, water for motive power, &c., will also, no doubt, soon help to augment the receipts.

The Directors have to inform the Shareholders that Edward Majoribanks, Esq., has ceased to be a member of the Board.

Viscount Malden, General Sir E. Walter Forestier Walker, K.C.B., and S. Noakes, Esq., retire from the directorate, but offer themselves for re-election.

Burroughs Dickie Kershaw, Esq., retires from the auditorship, but offers himself for re-election.

Dr.—Balance-Sheet, Dec. 31, 1877.

To Capital—			
10,000 shares, at £10 per share, paid up	£100,000	0	0
Debtures—			
Amount issued	£18,300	0	0
Less final instalment due Jan. 1, 1878	1,450	0	0
	16,850	0	0
Sundry creditors	1,464	18	8
	£118,314	18	8

Cr.—Balance-Sheet.

By Expenditure, as per last account, to the 30th of June, for works, construction, purchase of land, parliamentary, and incidental expenses	£96,616	10	3
Expenditure, as per last account, to the 30th of June, for pumping engines, plant and machinery, and cottage	9,288	12	1
Expenditure since the 1st of July, for continuation of extensions to Edgware, Mill Hill, Highwood, The Hyde, Kingsbury Green, Letchmore Heath, and sundry smaller extensions	7,219	13	6
Office furniture and fittings	96	13	5
Plumbing plant and tools	74	18	9
Stores on hand	1,173	17	11
House-stores	446	16	6
Debtors—			
For water-rates	531	7	4
Fittings and connections	385	13	7
Sundries	85	9	8
Cash—			
On deposit	1,000	0	0
At bankers	465	14	8
Petty cash	94	8	6
Revenue account—			
Balance	835	2	6
	£118,314	18	8

Dr.—Revenue Account, for the Half Year ending Dec. 31, 1877.

To Balance from last revenue account	£26	9	2
Office expenses, rent, stationery, &c.	74	17	1
Legal expenses	33	12	6
Wages	179	0	3
Salaries	63	5	6
Insurance of works, boilers, &c., for twelve months	31	2	3
Commission to collector	11	11	9
Rates and taxes	7	16	6
Stable expenses	20	14	11
Engine working expenses, less stores on hand	78	9	9
Lime	31	14	4
General working expenses (including rent of road, gas, cartage of pipes, &c.)	56	8	2
Compensation for damage done to van, and medical attendance to labourer injured	7	5	0
Labour and material repairing pipes	164	1	5
Meter repairs	1	11	3
Auditor	5	5	0
Interest on prepaid calls	0	2	8
„ „ debentures	524	0	7
	£1,320	7	1
Balance	£556	17	10
Interest on loans, as per last revenue account	31	12	7
„ „ calls paid in advance, as per last revenue account	230	14	7
Stamps for debenture bonds	15	17	6
	£835	2	6

Cr.—Revenue Account.

By Water-rates	£395	0	5
„ „ for building supplies	19	18	2
Meter-rents	18	17	9
Sale of chalk deposit	0	10	0
„ „ gravel, furze, &c.	3	14	0
Transfer fees	1	7	6
Flaming account	72	16	6
Interest on deposits	51	4	11
Balance	556	17	10
	£1,320	7	1

The CHAIRMAN: The first duty which devolves upon me, I think, is to ask you all cordially to join me in an expression of regret at the absence of our noble Chairman, who, in consequence of the anxious state of the health of his daughter, is obliged to seek a more genial climate than ours. I would rather dwell on his absence, because some Shareholders might imagine that his interest in this undertaking has somewhat abated by his not appearing here on one or two occasions; but that is by no means the case. He is just as alive to your interests, and the philanthropic undertaking in which he embarked when he joined us, as he ever was. But health is the first consideration, and he is obliged to go abroad on his daughter's account. I think those who have looked at the report, and at the balance-sheet, will see great cause to look hopefully on this concern. On the last occasion when we met here our receipts, which then covered, within a very small sum, our expenditure, were only at the rate of £1100 a year; but now, I am happy to say, they are upwards of £2000. But, at the same time, we have had to go to considerable expense in extending our works as far as Mill Hill, Edgware, and Highwood; and, as we had not the money, this has entailed our borrowing money on debentures, the interest on which, I am happy to tell you, has been paid by the extra receipts. [A SHAREHOLDER: Been earned?] Yes, earned. When I say earned, we have an increase of between £1000 and £1100 over what we had last year. We have the certainty of being able to pay the interest on those debentures. Highwood caused us some little anxiety, because its elevations are so high that we were doubtful, at first, whether we could supply them with water—whether our reservoir was sufficiently high to supply

them with water; but all anxiety has been relieved. The water has been turned on, and the supply is most abundant, and quite to our satisfaction. There has been some little annoyance by the road people, but we have laid our pipes, and they have been put in proper condition, and I think every one about there seems to be thoroughly satisfied that we are doing what we can to give them water, and put them to as little inconvenience as possible. There is much ground still to be covered by our pipes, which we have not yet encroached upon; but, in order to do that, we shall be obliged to get more money, and certainly we ought to reflect on it, because a good deal must be done before next June, or else some difficulties may occur with the road people, if they break up the roads. I hope that this is a matter which you will leave to the discretion of the Directors. I wish very much that it were in my power to declare a dividend to-day to the Shareholders; but with an undertaking of this sort, you must be perfectly aware that you must allow time for a return on the expense of laying down the pipes. That return, I think, if things go on as they are now doing, you may anticipate in, we will say, another year; and if things go on improving as they have been doing during the last six months, we shall be able to pay off all our little outstanding debts, and I hope there will be some considerable saving, which will return to the account of a dividend. Bear in mind this, that your Directors are just as anxious for a dividend as you can possibly be. Charity begins at home; and they will do their utmost, by economy, to bring the Company into a flourishing state. As yet there is only one-fifth of the houses which should take water supplied, and I must seriously impress on the Shareholders the advantage they would derive from urging their friends to take the water. Every house that takes water from us adds to our funds, and to the prospect of a dividend. With only one-fifth of the houses we get £2000 a year—more than that, because when this report was made out we were £100 short, but before it was printed we were considerably more than that £100 in pocket. Every house that takes our water will, as I have said, give us an additional sum to be applied to dividend; and if, with this one-fifth, we are able to look at our revenue as more than £2000 a year, when the other four-fifths come in—which I do hope they will do—you may rest assured that the interest on your philanthropic outlay hitherto will be very handsome—at least, I do trust so. We have now, with branch pipes, 40 miles of pipes laid; and when we have finished what we are entitled to by the Act, we shall have considerably more than double that. But we need not lay all of them down.

The SECRETARY: I think another 10 or 15 miles will suffice.

The CHAIRMAN: Since we last met, a vacancy has occurred on the Board by the retirement of Mr. Marjoribanks; but Mr. Bateman having so lately been added to the Directors, we have not thought it necessary to fill up that vacancy. With these few remarks, I move the adoption of the report.

Mr. SIMPSON NOAKES seconded the motion.

Mr. WATKIN asked how much of the £7200 expended since the 1st of July on extensions had been in laying pipes to Mill Hill and the other places mentioned, and what was the size of the pipes; and on that point, had there been a contract for the work done, and by whom had the contract been made, and with whom? Did any one receive a commission, directly or indirectly, on the work done for the Company? He took the balance-sheet to be correct in stating what the Company owed at present—all their debts were laid down correctly in the balance-sheet?

Mr. NOAKES: Up to the end of the year.

Mr. WATKIN: Then our Chancery suit has not cost so much as I anticipated?

Mr. NOAKES: It is included in the capital account—in the £7200.

Mr. WATKIN said he did not think it ought to be there.

A SHAREHOLDER suggested that an analysis of the items on which the £7200 had been expended should be read, as it might reply to many of Mr. Watkin's observations.

The SECRETARY read a list of the items, many of which were of comparatively small amount, the principal being Mr. Firmstone, for pipe-laying, £3800; and Messrs. John Aird and Co., for laying pipes, £2600; and the legal expenses were £254 12s.

Mr. WATKIN observed that there was another sum of £33 in the accounts for legal expenses.

Mr. NOAKES, in reply, explained that this £33 was chargeable to revenue account, on the debit side of which it appeared, while the other amount was chargeable to capital, the actions having been in connection with the fresh extensions. It formed part of the capital expenditure.

Mr. WATKIN apprehended, then, that there was no commission charged for the work at all. He found that the salaries for the half year were stated at £63 5s. 6d. How could that be?

The SECRETARY: That is the whole of the salaries for the half year.

Mr. WATKIN: But we pay £300 for Secretary and clerks.

The SECRETARY: That was last time, and it will come before the Board for next half year.

Mr. WATKIN: Then, as regards expenses, we are deficient.

The SECRETARY: We are improving every day, and this is not a charge for six months.

Mr. WATKIN said there were several items which he desired to call attention to—wages, £179; engine working expenses, £155; general working expenses, £56; and labour and material, repairing pipes, £104. He thought they were all under working expenses, and the item was large. What was the commission upon the collectorship? Then he found they had a charge for interest of £524 0s. 7d. for £16,850 of debentures. But the interest on this amount would be, for the half year, £421, and they were charged the difference between that and £524. And then the deficiency, without salaries, was £835. The item of interest paid on calls in advance, £230 14s. 7d., was in the account last Midsummer, when they had a balance of revenue carried forward of £26 9s., but it ought to have been £288 16s.

A SHAREHOLDER asked if any sums had been guaranteed for the payment of water-rates on the new extensions.

The SECRETARY: The Mill Hill School has guaranteed £200 a year for five years; Mr. Smith, £50 a year for five years; Mr. Healey, £50 a year for five years; and Dr. Harley, £20.

Mr. ROWBOTHAM, in reply to some of Mr. Watkin's questions, said he was sorry that Mr. Bateman's absence in the North of England prevented him from being present and giving the information required. Mr. Watkin required an explanation of the item of £7219 expended since the 1st of July on the construction of the extensions to the various places mentioned. The particulars of those items had been already furnished by the Secretary, and he (the speaker) could now answer *seriatim* the particular information desired by Mr. Watkin with respect to those works. The size of the pipes varied from 12 inches down to 3 inches. Generally the size of the pipe diminished as they got to the end of the district. For all the works—pipes, pipe-laying, valves, &c.—contracts had been made. For the pipes a contract was made with Mr. Firmstone, invitations being sent out to six or seven of the best pipe makers in the kingdom, and Mr. Firmstone's was the lowest tender. A similar contract was made with Messrs. Aird for the pipe-laying, and everything that had been done, prices had been received from the makers, submitted to the Directors, and after consideration decided on. With respect to the manner in which the work had been carried out, so far as engineering supervision was concerned, he might state that Mr. Bateman had no personal interest whatever. He gave



the whole of his time and advice to the carrying out of the work, but Mr. Bateman's assistants did the work, and the time they spent on the work was charged to the Company, and recouped to Mr. Bateman. He might state that the amount which would be charged to the Company for carrying out the whole of the extensions, which had been going on for nearly 18 months—including inspectors of pipes, pipe-laying, inspectors over the whole district in which the extension had been made—would amount to a little less than  $\frac{3}{4}$  per cent. upon the cost of the works; and the arrangement made with Mr. Bateman, or through his office, would certainly result in a saving to the Company of  $\frac{2}{3}$  per cent. at least upon the cost of the works. He thought he had answered all the engineering questions which had been put to him, but it occurred to him that he might add a few words as to the general question of the future of the undertaking. Fortunately, or unfortunately, for a period of now about 25 years he had been connected with water-works. Many of them had had to struggle into existence, and when they had got into existence they had had to struggle to keep in existence; and he could only say that, of all the water-works he had been connected with, the Colne Valley Water Company, in their early existence, promised to be as successful, and perhaps more so, than the others. As to the increase during the past half year, since the last meeting, they found by the report that the rental had nearly doubled in six months, and as, during that time, the districts to which they had extended their supply had not been earning dividend, it augured favourably for this year that a very large increase, almost corresponding to that which had already taken place during the past six months, might be looked for, and, he hoped, realized. But, to encourage those who might be a little despondent, it occurred to him to state what was said by Mr. Samuda, M.P. for the Tower Hamlets, when he attended, with the Water-Works Companies, Mr. Slater-Booth, the President of the Local Government Board, on Monday last. He gave the instance of the Kent Water-Works, a Company not dissimilar to theirs in this respect—that they pump water from the chalk, and at that time had a scattered and very thinly populated district. Mr. Samuda stated that, for almost 40 years, the average dividend earned by the Kent Water Company was only 1 per cent.; but that now—and this was a source of consolation to the Kent Company's Shareholders—the Company pay 8 per cent., and their shares were double their original value. Well, he (Mr. Rowbotham) thought the Shareholders in the Colne Company could look forward to a period very much shorter than 40 years, when they would have not only 1 per cent., but when they would get 8 per cent.; and when their shares, which perhaps they seemed now disposed to think not worth very much, would be worth double the amount which they paid for them. All these things were matters for encouragement, both to the Directors and the Shareholders.

Mr. WATKIN asked if the  $\frac{3}{4}$  per cent. mentioned by the previous speaker was on the whole amount.

Mr. ROWBOTHAM said on the actual cost of the work, which, he believed, had been a little less than £15,000. As a matter of fact, since Mr. Bateman joined the Board, all charges by himself had ceased, and the only charge made against the Shareholders had been the actual time and expense; but there had been no profit and no commission, and the Shareholders and Directors had had the benefit of his engineering advice upon all questions which had arisen, and especially in connection with the difficulties with the Road Trustees, as to which, had not Mr. Bateman been advising them, the other professional advice would have been necessary.

The SECRETARY, in reply to other questions, said the difference between wages and general working expenses was that the former item was for servants. The engine working expenses went for coal, tallow, oil, &c., to work the engines. General working expenses was an item for small things. As to "Labour and material, repairing pipes," there they had been unfortunate; but, as regarded the past two months, they had had nothing to complain of. Last year they had some very serious bursts, which came to £164. They were now going on very satisfactorily. As to the collector, his commission was  $\frac{2}{3}$  per cent., which he considered very moderate, as did Mr. Kershaw, one of their Auditors.

Mr. WATKIN thought they ought to pay only 3d. in the pound, instead of 6d.

The SECRETARY said: No doubt as time went on, and the amount became larger, the gentlemen who collected would reduce the commission. With regard to the debentures, they were started last February or March, and the interest was not for six months, but from the time the debentures were started to the 31st of December. They would now go on regularly. They would have to pay off the deficiency of £835 on the revenue account before they paid a dividend, but their revenue was increasing.

Mr. WATKIN expressed his regret that the "leading men" in their affairs did not know better than to take the Company into the Court of Chancery.

Mr. ROWBOTHAM thought that, on behalf of Mr. Bateman, he must relieve the Company's legal advisers of any liability in respect to the Chancery proceedings. If any fault was to be attached to any one for this, it must be fixed on Mr. Bateman; but that gentleman, after an experience of 50 years, had never had such a case before him—there was never such a demand made, that he knew of, as was made by the Edgware Highway Board.

The CHAIRMAN put the resolution for the adoption of the report, observing, in doing so, that the experience they had gained in the Chancery proceedings would be a lesson to them. They had the very greatest desire to economize—so great that a report of the proceedings of that meeting would not, as hitherto, be sent to the Shareholders.

The report was unanimously adopted.

Viscount Malden, Sir E. W. F. Walker, K.C.B., and Mr. S. Noakes, the retiring Directors, were then re-elected separately.

The CHAIRMAN, in reply, thanked the Shareholders, and said that he would do his utmost to promote the interests of the concern.

Mr. NOAKES gratefully acknowledged the confidence bestowed on him. He could promise, on his own behalf, to do all that he could for the advancement of the Company; and in the absence of the Viscount Malden, he would say that, only those who were on the Board could know how unceasing were his Lordship's efforts to promote the welfare of the Company. He himself looked forward with great confidence to the success of the Company. It was true that they were now only showing what they might call a balance of expenditure and revenue, but very little benefit was shown in the accounts as having come from the extensions already made; and he was quite satisfied that when the Directors met the Shareholders after June, they would have a very favourable balance-sheet to submit with regard to the revenue. Since the half-yearly account was closed, more than £200 had accrued to the Company from fresh supplies, and he was confident that they would derive a large revenue from the districts to which the extensions had been made. There were about 4000 houses in that district, only 800 of which were supplied, but every day demands were coming in.

The CHAIRMAN said he did not know whether any gentleman present was acquainted with the neighbourhood of Mill Hill and Highwood. Building would be carried on largely in those places, and every house that was built there would add to the Company's funds.

Mr. B. D. Kershaw was then re-elected an Auditor.

Mr. C. E. KEYSER said that, as he was on the Finance Committee, he would read a letter which he had received from Mr. Kershaw. It was to the effect that, in the present financial state of the Company, Mr. Kershaw would be happy to audit the accounts without taking any fees for the work. Mr. Keyser added that the other Auditor of the Company, Mr. Blackwell, had always audited the accounts for nothing.

The CHAIRMAN having affixed the seal of the Company to the list of Shareholders,

Mr. TOOKE proposed a vote of thanks to the Chairman. He was sure they regretted the absence of Lord Malden, and its cause, but he thought that the chair had been very efficiently taken by their Vice-Chairman, and that they could not have had a better man to preside in the absence of Lord Malden.

The CHAIRMAN having briefly acknowledged the compliment, the proceedings terminated.

#### DERBY WATER-WORKS COMPANY.

The Half-Yearly Meeting was held on the 27th ult.—Mr. C. GASCOYNE in the chair.

The following report was presented:—

The Directors have pleasure in submitting to the Shareholders the subjoined statement of the Company's accounts, for the half year ending Dec. 31, 1877.

The sum of £1772 14s. 4d. has been expended on capital account during this half year, and the whole expended capital now amounts to £178,717 12s. 11d.

The gross receipts from revenue amount to £6786 5s. 3d., compared with £6382 5s. 3d. in the previous (or June) half year, showing an important increase of £504, which is considerably larger than the average half-yearly increase since the new works commenced in 1869.

The revenue expenditure is £3602 3s. 9d., which, compared with £3730 0s. 9d. in the previous (or June) half year, shows a reduction of £117 17s. in the cost of management, notwithstanding a considerable augmentation of the official staff, which has been lately made.

The net realized profit available for dividend is £3184 1s. 6d., which, compared with that of the June half year (£2562 4s. 6d.) shows a satisfactory increase of £621 17s. in the Company's favour, which is larger than that obtained in any previous half year; and the Directors are enabled, with the aid of £1161 2s. 8d. from the reserve-fund, to recommend a dividend similar to that of last half year—viz., 8 per cent. on the original shares, and 7 per cent. on the new—leaving the reserve-fund £2084 17s. 11d.

As already stated, the Company's staff has been necessarily increased, and such stringent supervision has been established over every department as, in the conviction of the Board, will produce still further satisfactory results.

The machinery and plant are pronounced by the Engineers to be in good working condition, except that the old engines require some repair, and that an outlay is still needed for drains from the new reservoirs.

The water supply in every district is both good and abundant, and the Directors can justly congratulate the proprietary on the sound and prosperous condition of the Company.

The Directors who retire by rotation at this meeting are Mr. Handyside, Mr. Gisborne, and the Hon. W. M. Jervis, who are eligible for re-election.

The Auditor who retires at this meeting is Mr. William Peat, who is also eligible for re-election.

The CHAIRMAN, in moving the adoption of the report, said he thought the statement of the Company's affairs would, under the circumstances, be deemed tolerably satisfactory. It had given the Board very considerable pleasure to have to present it, because many difficulties had overtaken them of late, and their capital enlarging so rapidly had rather overrun their resources for the moment, although there was an immediate prospect of a full recovery. It was stated at their last meeting that about five half-years would be required to bring about that recovery; but they would find, on looking down the balance-sheet, that £622 had been saved during the half year. It was a most successful half year; and seeing that they were now only some £1500 behind, and that £622 had been received during the half year, the fact seemed to be clear that probably not five, but only three or four half-years would be required to redeem the momentary difficulties in which they were placed. He believed that most fully; and the knowledge of their position during the first month of the current half year, his knowledge of the greater quantity of water sold, and of the greater number of houses supplied, gave to him evidence that they might reasonably expect their return to prosperity would be very soon. They must recollect that there had been a vast depression of trade, not only in Derby, but all over Europe. It was a serious drawback to the Company; but, taking all things into account—the demolition of houses consequent upon the Great Northern Railway passing through the town—they were in as good a position as they could possibly expect. Of course, when the railway developed, there would be a return equal to, or greater, than that which was taken away. He could not but feel astonished that the resources of the Company were so elastic as they were. They had supplied during the year 1224 additional houses and shops with the Company's water, 742 being during the half year. The capital when they commenced their new construction nine years ago was only £60,000; it was now nearly £180,000—an increase of £120,000 in nine years. The dividends and interest paid at the former period were £4533 only; the annual dividends and interest last year were £11,675, the difference between the two periods being £7142 per annum. They were now paying slightly under the maximum dividend; but notwithstanding this it was only necessary that day to reduce their dividend by 2 per cent. upon the 10 per cents., leaving the 7 per cents. as they were; and he doubted not that, although something was taken out of the reserve this time, on another occasion it would not be necessary. Indeed, the Board would be unwilling to recommend the reduction of the the reserve further, neither did they desire to raise the price of water. They deemed it a wiser policy to bear the loss just now and not raise the tariff. A large power remained to them by which, with a stroke of the pen, they might wipe off all difficulty, and raise money to pay dividends. If they looked at Manchester, water there by meter cost 2s. per 1000 gallons the maximum, and 6d. the minimum price. There were plenty of other towns beside with a higher tariff than Derby, but he noticed Manchester in chief because Manchester was in the hands of the Corporation, and Corporations, they knew, never did wrong. The Derby Water-Works Company charged 10d. as the maximum, and 3½d. as the minimum price. The Company preferred to maintain low rates, even at the cost of a reduction of dividend, than adopt a higher scale of rates, and create a feeling amongst their consumers that they were oppressed. He regretted to state that there was still a considerable waste of water. In addition to their able Engineers and the resident Engineer, who was now appointed, they had an efficient and energetic staff of officers. That staff had lately been very much increased, and the work was done admirably, and their efforts were calculated to bring the resources of the Company up as fast as possible. The Shareholders might rest assured that, with the energy and activity displayed, an early and full prosperity would arise. He did not feel that it was desirable that any controversial matter should be introduced that day, but the Shareholders could receive what information they desired in the office.

Mr. RICHARDSON seconded the motion for the adoption of the report.

Mr. WOODWARD called attention to the very large amount of outstanding debts. He thought that if those had been properly collected there would have been no necessity to trench on the reserve-fund. The amount of outstanding debts was £1190 12s. 10d.

The CHAIRMAN explained that the amount of outstanding debts made no difference in the accounts. They were not bad debts. In the statement



of accounts the receipts and payments were taken during the half year and compared together, and, of course, they spoke for themselves.

The SECRETARY (Mr. Walker) said there were always some outstanding debts. Where water was supplied by meter, they could not commence collecting the money due until the end of the half year.

The motion was agreed to.

The CHAIRMAN then moved the declaration of a dividend of £1 per share on the original shares, being at the rate of 8 per cent.; 9s. 8d. per share on the £12 10s. shares, being at the rate of 7 per cent. per annum; 8s. 9d. on the new ordinary £25 shares of 1875, being at the rate of 7 per cent. per annum; 4s. 4½d. on the new ordinary £12 10s. shares, being at the rate of 7 per cent. per annum; payable on the 1st inst.

Mr. BOWRING seconded, and the resolution was passed.

The retiring Directors and Auditor were re-elected, and severally returned thanks.

Mr. C. HAWKSLEY, one of the Engineers of the Company in the construction of their works, addressed the meeting on the invitation of the Chairman. He said the new works having now been completed and brought into successful operation, it was proper as one of the Engineers that he should be present at that meeting. He thought the Shareholders would be pleased to know that both the old and new works of the Company were in excellent condition. The new works being now completed, and having been brought into operation, the Company were enabled to supply the highest parts of the town with water, a greater pressure of water having been provided than the old works were able to supply. He then alluded to the formation of the large population on the higher portion of the town, and the necessity which arose for a better water supply to them. That had now been effected. In reference to an observation made by a gentleman present in regard to the reserve-fund, Mr. Hawksley observed that this fund had been formed by Act of Parliament, and that it was set apart for the purpose of meeting, amongst other things, the contingency to which it had been applied by the Derby Water-Works Company—namely, making good any deficiency of profits which might arise in a particular year. He referred to some of the works the Company had accomplished—such as the new pumping-station, filter-beds, and placing the water they supplied at a higher level, in order to give a better supply to that part of the town where houses had been constructed at a higher elevation than in the old portion of the town. They had also erected some excellent offices to meet the increasing necessities which would arise from the increase of business due to the enlargement of the town. In conclusion, he bore testimony to the ability of the resident Engineer the Company had appointed.

Mr. BOWRING proposed a vote of thanks to the Chairman, Directors, and Auditors, for their services during the year. After what Mr. Hawksley had said, he felt perfectly satisfied that they had acted in a perfectly legitimate manner in drawing upon the reserve-fund. There was every prospect of the very successful working of the Company.

Mr. WOODWARD seconded the motion, which was carried unanimously.

The CHAIRMAN returned thanks, referred to the interest he took in the Company, and testified to the zeal of the Directors in looking after the interests of the Shareholders.

Mr. HUISE moved votes of thanks to the officers of the Company, and the motion being carried,

Mr. WALKER (the Secretary) acknowledged the compliment, and the meeting terminated.

#### SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.

The Annual Meeting was held on Friday, the 22nd ult.—Mr. R. VINT in the chair.

The Directors report, which was taken as read, was as follows:—

In presenting their thirteenth annual report and statement of accounts, your Directors have pleasure in congratulating the Shareholders on the continued steady progress in the affairs of the Company during the past year, notwithstanding the unusual depression that has existed in the several departments of trade and manufacture, materially affecting the various sources of the income of this Company.

Your Directors recommend that a dividend at the rate of 5 per cent., on the ordinary and preference stock of the Company, for the half year ending Dec. 31, 1877, be declared, payable on the 1st of March next, making, with an interim dividend paid on the 1st of September last, 10 per cent. for the year; also that interest at the rate of 5 per cent. be paid on the amount called up on the shares allotted on Sept. 3, 1875, in accordance with the 21st section of the Company's Act of 1868.

Considerable progress has been made with the works at Dalton. The 24-inch main from Dalton to Ryhope having been completed and connected with the system of pipes already laid down, the Directors are anxious to get the engines into operation as early as practicable, to enable them to meet the largely increasing demands of the district. During the year 19,480 yards of additional main, and 1482 services, have been laid. The whole of the pumping-stations of the Company having undergone a thorough repair, are now in good working order.

Your Directors regret to report the death of their late Secretary, Mr. William Dixon, one of the original Shareholders of the Company. He was elected Secretary in 1858, having previously filled the office of a Director for a period of six years. From the time of his election until the date of his decease, he was unremitting in the execution of his duties, and in his attention to the welfare of the Company; this, coupled with his courteous manners and genial temperament, had justly endeared him to the Board.

The retiring Directors are Messrs. Robson, Grimshaw, Matthew, and Tone, and the retiring Auditor is Mr. H. G. Armstrong; all of whom are eligible for re-election.

The CHAIRMAN moved that the report of the Directors be received and adopted. Referring to the working expenses, he said in rates they had had to pay £3495, which was an increase of £220. In 1874 they paid £2254, and since that time—in three years—their rates had increased by £1240 a year. This was a thing that they had very much regretted, but he believed that they were not alone in regretting this state of affairs, for all the owners of property seemed likely to be eaten up by rates. They had expended £2506 under the head of repairs. They always had an item for repairs, because they had large works. But every now and then they found that it was necessary to more especially overhaul some of the engines. During the past year they found this to be the case with the engines at Fulwell, and these, he believed, were now quite equal to what they were in the first place. This alone cost £500, and the total increase under the head of repairs was £830. Then there were items which were decreased this year. They had spent in wages £3871, being less by £457 than last year. In coals, cartage, and carriage they had expended £9007, which sum was £500 less than that of last year, partly from the decreased price of coal, and partly from changes made in the fuel. In salaries they had a decrease of £353. The total expenditure under the head of working expenses was £16,524, as against £16,647 last year, being a saving of £122. With respect to the extensions at Dalton, he confessed that they had hoped to be more near completion than they were at present, but they had had curious difficulties to contend with. They had one great difficulty in the great depth, and another difficulty was in respect of the quantity of water. Of course, the quantity of water which was at present a difficulty would be a great gain in the future. He believed that he was safe in stating that, when the works at Dalton were brought into operation, they would have such a quantity of water from them as would add more than 50 per cent. to their present available resources. With that addition to their resources, when a revival of trade took place, they anticipated a large addition to their dividends. During the year they had laid 14,000 yards of mains. Including the mains they had been laying to supply Shields, they had laid nearly 20,000 yards of mains, which was a considerable amount of work. Then, in con-

nection with these mains, they had 1482 services, which meant a number of new customers, and was 110 more than in the previous year. With respect to the offices at Shields, he was happy to say that they were now finished, and in the course of the next week or two they would have removed to more suitable offices. He was agreeably surprised to find that, in spite of the bad trade, their district had so much vitality in it, that the Company had still gone forward, and had an addition of about £1000 to their income. They must consider this highly satisfactory. They had a balance available for dividend of £27,110, and that, after dividing, as they would be asked to do in the resolutions to be proposed, they would have £11,485 to carry forward. Taking the whole thing into account, he thought that they might congratulate themselves upon being in so fortunate a position. The future prospects of the Company were certainly not such as to make them despond.

Mr. GLOVER seconded the motion, which was carried.

Mr. THOMAS DAVISON moved—"That a dividend at the rate of 5 per cent. on the ordinary and preference stock of the Company for the half year ending Dec. 31, 1877, be now declared, and the same be paid on the 1st day of March next, and that interest at the rate of 5 per cent. per annum be paid on the amount called up on the shares allotted Sept. 3, 1875."

Mr. T. PARKER seconded the motion, which was carried.

Mr. WILLIAM MOORE moved, and Mr. JAMES LAING seconded—"That the whole of the share capital authorized to be raised by this Company by the Act of 22 Vict., cap. 6, having been subscribed for, and the full amount thereof actually paid up, it is resolved that this Company do borrow on mortgage or bond the sum of £32,500, being the amount authorized to be borrowed by that Act, and that the said sum be from time to time borrowed in such sums or amounts, at such rates of interest, and in such manner as the Directors shall from time to time determine and order."

The motion was agreed to, and the retiring Directors and Auditor were re-elected.

A vote of thanks was given to the Chairman and Directors for their valuable services during the past year. The motion was carried unanimously, and was acknowledged by the Chairman.

Mr. M'QUIGAN said there was a desire on the part of some of the Shareholders present to be informed as to the nature of the communications which had passed between the Corporation and the Company. He saw in a local paper that there was a probability of a parliamentary contest between the two bodies. He should very much deprecate the Ratepayers and the Shareholders money being expended over law proceedings.

Mr. GAYNER also asked for information, at the same time expressing his confidence in the Directors.

The CHAIRMAN said this was a question which he had expected to be asked. The Directors had had a communication from a Committee of 18 appointed to represent the Sunderland Corporation, and who desired to have an interview with them. The Directors, of course, considered the matter very carefully. They were of opinion that they held a very valuable property, and one which was increasing in value every day. They believed also that they had fulfilled their obligation to the public. They had given them pure water, and plenty of it, a constant supply under high pressure day and night, and a low price. These were the four things which Corporations of places less favourably situated were asking for. These they had given this district for 30 years; the great main from Humbleton never having been turned off, except for temporary purposes, since it was laid down. Under the circumstances, the Directors did not see there was any reason for them to meet the Corporation Committee. They were not prepared to part with their property, and it was felt a meeting could lead to no good result. He hoped the Shareholders would leave the matter in the hands of the Board. He had received a letter from Mr. Snowball, delivered since he came to the meeting, but it had not yet been considered. He desired the meeting to understand that whatever was done by the Board would be done in the interests of the Shareholders. As some of the largest Shareholders sat at the Board, he was quite sure that if they would leave it in the hands of their Board, they would have no reason to be dissatisfied. Of course, it was a very large affair, and would require a great deal of consideration. They represented a very large area, of which Sunderland was only a portion. There were important Corporations in South Shields and Jarrow, and an important Local Board at Hebburn, and their business was very large indeed on the banks of the Tyne. They had had no communications with these bodies on the subject. He trusted that the Shareholders would still continue their confidence in them.

In answer to a Shareholder, the CHAIRMAN said they had not had complaints from any quarter.

Mr. M'QUIGAN explained that he had put the question through no lack of confidence in the Directors, but because gentlemen who had bought recently issued shares considered a sale at present might be to their disadvantage.

The meeting then terminated.

HOWDEN GAS COMPANY.—The report presented at the annual meeting on Monday, the 4th inst.—Mr. Tireman in the chair—was of a highly satisfactory character. The cost of coals was £100 less last year than during 1876, and the receipts for gas consumed £60 more. A dividend was declared at the rate of 8 per cent., and it was resolved that the price of gas should be reduced to 6s. 8d. per thousand.

RICHMOND (SURREY) PUBLIC LIGHTING.—At the meeting of the Richmond Vestry on the 19th ult., the following report by Mr. Whipple, the Public Lighting Inspector, was read:—"I have the honour to inform you that, on the 31st ult., I examined the meters attached to the public lamps, and found the consumption during the past three months to have been as follows: For the lamp at the Kew Road drinking fountain, 5730 feet; Black Horse, Marshgate, 7160; Star and Garter (opposite), 9010; Hill Street (opposite Vineyard), 6220; White Cross, Water Lane, 5370; the Square at Rose and Crown, 8780. The total number of hours which elapsed between sunset and sunrise during the same period was 1442. Assuming, therefore, this to have been the time during which the lamps were lighted, I find the average hourly consumption for each lamp has been as follows: The Kew Road lamp, 4.0 feet; Black Horse lamp, 5.0 feet; Star and Garter, 6.2 feet; Vineyard, 4.3; Whitecross, 3.7; Rose and Crown, 6.1; and the average of the whole, 4.9 feet per hour. The Kew Road lamp had its pipe choked with accumulated water; this will account for its low consumption, to a slight extent. I have no information as to the condition of the White Cross lamp, the rate of which is least of all. In compliance with the request of the Highway Board, I would respectfully submit to the Vestry that, in my opinion, the present position of the gas pressure registering apparatus—namely, on the outlet pipe of the meter—is defective, as it renders it liable to be affected to an undue degree by the fluctuations of pressure caused by the lighting and extinguishing of the gas-burners in the clock tower and other parts of the engine-house, and hence it is not a true indication of the pressure existing in the street-mains. As the Gas Company are willing to lay on a special service-pipe connecting it with the main independently, I would venture, with due deference, to suggest that this should be done forthwith." It was resolved that Mr. Whipple's suggestion be adopted.



## THE LANARKSHIRE COAL TRADE.

[From the Glasgow News.]

Something closely resembling a crisis is slowing but surely approaching in one of our great staple industries in Lanarkshire, and, unless we have a speedy turn in the tide of commercial affairs, there will be a storm which, in the very nature of things, must send the weakest to the wall and tax the strongest to the uttermost. Never in the whole history of the coal trade has there been an epoch so peculiar and likely to be so trying as that which will mark the year 1878. A period of depression has been expected for the last three years; but, at the same time, no one anticipated it would continue so long or reach so many points below mercantile zero. Had this depression been foreseen, the sinking of new pits to enormous depths, at enormous cost, would have been delayed until activity and enterprise had once more regained their sway in the commercial world. Coalmasters had their innings, and so had the miners, but now a severe reaction has set in against both. Having no Joseph to warn them to lay up corn for the years of famine, it is possible that before the time of depression passes away the lean kine will have eaten up the fat, and there will be nothing but murmuring in the city and misery in the land.

In addition to the ordinary causes of commercial stagnation, two other circumstances have occurred which influence in a material degree the local depression of Lanarkshire. Among these are the opening of new pits, whose produce has been thrown upon a stagnant market, and the result is that household and shipping coals have fallen below cost. It is ridiculous to suppose coalmasters will continue to work at a loss, so we may hope for the remedy in the closing of a few pits until a demand for their output arises.

It is curious that while all other classes of coal are receding in price, gas coal shows a tendency upwards. This is doubtless chiefly due to the fact that the demand for gas coal has never abated, but rather increased, since the period of high prices; and, while this is true, the supply has simultaneously diminished instead of having increased. Much of the cannel, too, is wrought with other coal, and when workings are suspended or stopped, of course no gas coal is put out. This causes a deficient supply, which, with a steady demand, results in a rise.

The continued depression suggests that owners might, with great propriety, go to the Railway Companies and ask back the advance which was made on the railway dues in better times. The Companies would be penny-wise and pound-foolish were they to refuse so moderate a request. Rolling-stock is stated to be but indifferently employed in mineral traffic just now, and, if so, it would be better to make a timely concession in the rates of transit. Such a change could not but act beneficially on the market, and consequently increase traffic receipts.

## IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The trade transactions of the week have not been on a very extensive scale; but the course taken by the Cleveland ironmasters for effecting a reduction of the output, together with the more pacific turn of public affairs, have had a tendency to make vendors rather more confident as to the prospects of the immediate future, and, consequently, somewhat disposed to be firmer in their present demands. A Leeds house of smelters and general merchants have issued a circular in which they estimate that the action of the Cleveland ironmasters will result in the withdrawal of fully 6000 tons of pig weekly from the market; and they, therefore, anticipate an early rise in prices. The current quotations for "Aireside Leeds" pigs are, for No. 1, 52s.; No. 2, 48s.; No. 3, 46s.; No. 4, 45s.; forge, 45s.; M, 44s.; and N, 43s. "Acklam, Yorkshire," No. 1, 45s.; No. 2, 43s.; No. 3, 41s.; No. 4, 40s.; and forge, 40s. North Yorkshire G.M.B., No. 1 foundry, 44s.; No. 2 foundry, 42s. 6d.; No. 3 foundry, 40s. 6d.; No. 4 foundry, 39s. 9d.; No. 4 forge, 39s. 6d.; mottled, 38s. 6d.; white, 37s. 6d.; refined metal, 57s. 6d.; Kentledge, 43s.; and cinder, 36s. Hematites continue firm, owing to the increasing activity of the Bessemer trade. At the foundries there is a moderate amount of work in hand, chiefly on gas and water pipes, some small contracts for which have recently been placed at prices ranging from £5 to £5 10s. per ton.

Coal is easier in all directions, and is not unlikely to become more so, as soon as the owners have decided upon the amount of the reduction to be made in the wages of the miners.

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Both the coal and iron trades of this district continue extremely dull; the production in each of these branches of industry, notwithstanding the restrictions which have been put upon it, being still considerably in excess of the demand, whilst prices are weak, needy holders underselling the market to secure orders.

For all classes of round coal there is a continued falling off in the demand, and stocks are going down in some cases, whilst in others colliery proprietors are simply working up to their orders, the pits being stopped when the waggons in the sidings have been filled. The demand for round coal for house-fire purposes is now only very limited. The requirements for gas-making purposes are also growing smaller with the approach of summer, and common round coal for iron-making and steam purposes continues a complete drug. For the better classes of engine fuel there is a moderate demand, but common sorts are almost unsaleable. So far as prices are concerned, although nominally the list rates are without change, and no further reductions beyond those made at the commencement of the month have been announced, the tendency is downwards; and in many cases there are no fixed rates, holders being willing to sell at almost any price they can command in the market. The quoted prices at the pit mouth range about as under:—Best screened Wigan Arley, 10s. to 10s. 6d. per ton; common Arley, 8s. to 9s.; Pemberton four-feet, 8s. to 8s. 6d.; common round coal, 6s. to 7s.; forge and steam coal, 5s. 6d. to 6s.; burgy, 4s. 6d. to 5s. 3d.; good slack, about 3s. 6d.; and inferior sorts 1s. per ton less.

The demand for shipping purposes is still extremely small, and common steam coal is offered at the High Level, Liverpool, at 6s. 6d. per ton.

The iron market continues in a very unsatisfactory condition. Local producers of pig iron are still unable to secure any business of importance at the prices they are quoting, and the greater portion of the small business doing in this district is passing into the hands of outside makers, who are able to undersell the local houses. With regard to the finished iron trade, although one or two Government orders in connection with the present war preparations have recently been received in the district, there is no improvement so far as the general demand is concerned, and prices remain very low; Lancashire and Middlesbrough bars, delivered into the Manchester district, being quoted at £6 2s. 6d. to £6 5s., and North Staffordshire ditto at £6 2s. 6d. per ton.

The strike in the finished iron trade is now at an end, the men having been compelled to accept the reduction of wages already announced.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There were good average shipments of gas coals from the Tyne last week. Several cargoes of the best qualities were sent to Stockholm, and there were more inquiries for gas coals higher up the Baltic. The Germans, however, seem to be anxious to push their coals into the market and are trying to drive a keen competition with the colliers of the North of England for the Continental and Baltic business. The demand for best gas is unchanged. Prices remain about the last quotation—from 7s. 6d. and 7s. 9d. up to 8s. per ton; but contracts have been made, and most of the best gas coal has been sold in the open market at something like 7s. 6d. per ton. The requirements of the Mediterranean have been met; at any rate, the shipments thence were quiet last week, except to the ports mentioned. There is very little business doing to the Upper Baltic. There are no orders from Holland, and very few from the north of France. The United States Gas Companies have ceased to import British coals; or, what is pretty much the same thing, they offer such very low freights that steam shipowners prefer to run their boats out to America in ballast rather than take them. There is the ordinary coasting demand for gas coals; but nearly all that is being shipped has been sold under contract. A quiet business is being transacted in steam coals, and the house coal trade is dull. House coals were reduced 1s. per ton last week.

Coasting freights were scarcely ever so low in March as this year. Small sailing ships were freighted last week at 5s. 4½d. per ton to discharge gas coals at the wharf below bridge, for the Commercial Gas Company. Coal freights for steamers to London did not exceed 4s. 1½d. per ton. Rates for Poole were down to about 6s. 8d., with all other Channel ports corresponding. There was literally no business for the East Coast of England. It was impossible to get freights for sailing vessels at any price, however low. There were no orders in the market. Some more gas coals have been shipped for Ireland by steamers at low rates. The Mediterranean and other freight markets were considerably depressed last week.

The Middlesbrough ironmasters have come to an agreement to blow out several of their blast furnaces, and there is a further movement for the reduction of the wages of ironworkers. Our manufactured iron is subjected to a good deal of competition on the Continent, especially by the Germans. The Germans are undoubtedly selling their iron at a loss, and it is pretty certain that the sharp competition with British coals, in all the ports accessible to both, is driving the German coalowners to sell their coals at a loss too.

The travellers for commercial houses on Newcastle Quayside who have returned from the Continent, describe trade there as even worse than in this country. The same thing is going on there as with us: what may be termed over-production; and except in specialties a loss is incurred upon almost every transaction. The chemical trade of the Tyne was a little brighter last week, but it will be seen that other matters, as well as the war, tend to keep back a favourable re-action in the markets. A moderate quantity of fire bricks and other material for furnace building are being shipped, but the general manufacturing trade has shown very little improvement during the past eight or ten days, notwithstanding the signing of the Treaty of Peace.

## TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

By a curious coincidence, the subject which engaged the attention of the Society of Arts, London, last Wednesday night—namely, the lighting and extinction of street lamps by electricity, was also the subject of a paper brought before the Philosophical Society of Glasgow on the same evening, by Mr. Mortimer Evans, C.E., Mem. Soc. Tel. Engineers. A number of very interesting experiments were successfully performed by Mr. Evans, in illustration of the highly ingenious system devised by Mr. St. George Lane Fox. The Lord Provost and other members of the Corporation Gas Committee were present, and, with the ordinary members of the Society, were much pleased with the practical demonstrations made by Mr. Evans. At the same meeting, Mr. W. Foulis, the General Manager under the Gas Corporation, described his new district gas governor, which he exhibited, and practically illustrated the system of working. He also drew attention to his pneumatic system of lighting street lamps. The first paper read at the meeting referred to was one by Dr. Wallace, F.R.S.E., Gas Examiner for the city, on "The Safety Lamps at present used in Coal Pits," so that the meeting was of peculiar importance to people interested in gas matters.

Artificial light was the subject brought under consideration by Mr. M'Gilchrist, Manager of the Corporation Gas-Works, Dumbarton, at the last fortnightly meeting of the Philosophical Society of that town, and it was treated with an ability that made it exceedingly interesting and instructive. The essayist showed that he was thoroughly in love with the subject, and whilst glancing by way of introduction and illustration at various topics only incidentally or, it might be said, poetically connected with it, he at the same time displayed an extensive and accurate knowledge of it, alike in its scientific and practical aspects, and illustrated his remarks by a series of beautiful experiments, several of which gave forth perfect floods of light. In the conversation which followed, the paper was warmly praised, and one or two attempts to trip up the author as to the quality of the town's gas and the amount of individual accounts were replied to in a racy and trenchant manner.

My friend, Mr. Key, was good enough to make a correction in last week's JOURNAL, in reference to a matter on which I had made a slip in my "Notes" in the previous week's issue. I find that another correction must now be made; which I hasten to make myself, if Mr. Key has not forestalled me. It is to say that the highest bonus, that of £140, on the results of last year's gas making, was earned by Mr. Manwell, of the Glasgow Corporation Gas-Works, Dalmarnock, and not by the District Manager whose name I mentioned in connection with it last week. I make the correction all the more freely, from the fact of my attention having been drawn to the mistake by a gentleman who is altogether an "outsider."

By authority of the Gas Committee of the Aberdeen Town Council, contracts, amounting altogether to £1738 11s. 6d., have been entered into for the enlargement and extension of the gas-mains to Woodside, Mugie-moss, Queen's Cross, and Beechgrove Terrace, and for cutting the pipe tracts in connection therewith. The same Committee, having considered a memorial from the Gas-Meter Inspectors for increase of wages, recommended to the Town Council that no increase be granted, on the ground that, in 1872, their wages were advanced from 16s. to 17s., and their hours of labour reduced from 56 to 51 per week; while since then their wages have been advanced from time to time, till they are now 20s. per week.

It was recently announced that the Police Commissioners of Inverness had resolved to erect a new and larger gasholder, and at a meeting held on Thursday last they accepted the contracts for the same, the total amount being £3530, of which £560 is for the excavation work. At the same meeting, the question of supplying gas to the Highland Railway Company was again under consideration. As they were told by the Commissioners some time back that, by the terms of the Act of Parliament, it was impossible to reduce the price of gas to the Company to a lower rate



than that paid by the general consumers, they advertised a few weeks ago for tenders for the erection of gas-works for their special wants. Since then a conference has been held between Mr. Waterston and Mr. Dougall, as representing the Railway Company, and a Committee of the Police Commissioners, and the result of the conference was reported to that body at last Thursday's meeting. As the Act will not allow of a reduction in the price of gas, the Commissioners offer to reduce the price of water to a net rate of 4½d. per 1000 gallons, to be increased or decreased in proportion as the general water assessment shall rise or fall. The Railway Company's representatives promised to lay the matter before the Directors, and there it rests in the meantime. It is thought that some friendly arrangement will be arrived at by which the Police Commissioners will be able to retain the Railway Company as customers both for gas and water.

Last Friday afternoon four shares of the Montrose Gas Company were exposed for sale by public auction. There was a very large attendance. They were put up singly, at £55 each, and realized from £55 10s. to £56 12s. 6d. per share, and were all secured by the same purchaser. Other two shares were exposed for sale at the same time, and the same upset price, and were both bought at £55 7s. 6d. each.

A special meeting of the Locherbie Police Commissioners was held last Wednesday evening, on which occasion the proposal for acquiring the local gas-works, situated at Townfoot of Locherbie, was brought up for further consideration. It was unanimously agreed that the said gas-works be acquired by the Burgh Commissioners, in terms of the "Burghs Gas Supply (Scotland) Act, 1876."

The Dundee Gas Commissioners held their usual monthly meeting last Wednesday—Provost Robertson presiding. Mr. Maxwell, convener of the Works Committee, reported that, as instructed at the previous meeting, he and the Manager had sent out circulars to all gas consumers throughout the town, instructing them how to act in the event of an escape of gas occurring in their houses. It was also reported that the gas-rental for the ten months ending the 28th of February was £38,752 18s. 11d., being £622 2s. more than was collected at the same date last year.

At the ordinary monthly meeting of the Dumfries Town Council, held last Thursday evening, various matters were resolved upon, which arose out of the recent arbitrations for the transfer of the gas-works to the Municipal Authorities. It was agreed to place the works under a Gas Committee, consisting of nine members of the Council; and after a long discussion it was resolved, by a majority of 13 votes against 8, that Baillie-Wood should be the convener of the Committee. That gentleman, it may be remembered, has long taken a very active interest in the local gas affairs, and this he has shown by his efforts to get the gas supply transferred to the town, both before and since the passing of Sir Windham Anstruther's Gas Act, and by his voluntary labours in the capacity of the Local Gas Examiner.

As regards water affairs, I may summarize this week's news in the following way:—The Arbroath Police Commissioners are doing their best to keep out of a difficulty which is threatened in their relations with the Board of Supervision on the water question. At present they are in treaty with the Dundee Water Commissioners as to getting a suitable supply from Crombie; and they also have a prospective scheme of their own, that of the Nolt Loan. The Kilmaccolm Local Authority are proceeding energetically to secure an abundant supply of water for that rapidly rising village. Considerable extensions of the distributing mains are about to be made in connection with the Stirling Water-Works. A compromise has been arrived at between the Police Commissioners of Forfar and the Manufacturers on the question of the assessment which is proposed in the Water Bill now before Parliament, the result being that the threatened opposition is withdrawn. Messrs. Bell and Miller, Civil Engineers, Glasgow, are at present engaged with a preliminary survey, with the view of providing a new water supply for the town of Annan. An excellent supply of water has been laid on to a part of the town of Kirkwall from Papdale.

Friday's Glasgow pig iron market closed with sellers at 51s. 7½d. one month, and 51s. 6d. cash, or 5d. per ton over the close on the previous Friday.

The coal market seems to be undergoing a slight improvement, but orders are still difficult to obtain.

**EAST BRENT WATER SUPPLY.**—To ensure a further good supply of drinking water to the inhabitants, in addition to the reservoirs which have now been completed at a cost of several hundred pounds, Archdeacon Denison intends shortly to commence boring operations for a new spring.

**SKENNESS GASLIGHT AND COKE COMPANY.**—From the first annual report of this Company, just issued, it appears that the present number of Shareholders is 46, and that the works in progress, which will cost £2676, are to be completed by the first of May next. The Directors entertain sanguine hopes of the prosperity of the Company, and congratulate the Shareholders on the progress made to the present date.

**TENTERDEN GAS COMPANY.**—The annual meeting was held on the 20th ult.—Mr. E. Finn in the chair. A satisfactory report from the Directors was read, and a dividend of 7 per cent. was declared. The sum of £260 8s. 8d., borrowed capital, has been paid, leaving the Company clear of liabilities. The price of gas is to be reduced from the 1st of April next.

**COST OF GAS IN NEW JERSEY.**—A suit is pending in the Passaic County (New Jersey) Court between the Gas Company and the city of Passaic. George Denholm, an expert, and one of the employees, testified that the cost of manufacturing gas in that city by the Company, counting all the leakage and waste, and other incidental expenses, in addition to the material and labour, was about 2 dols. per 1000 cubic feet. They furnish gas to the public at 3 dols. 25 cents per 1000, with a discount of 5 per cent. for prompt payment, which makes the price 3 dols. 9 cents net. Mr. Denholm also testified that it could be made considerably cheaper if they made more.—*Saward's Coal Trade Journal.*

**HULL GAS SUPPLY.**—Mr. J. Baynes, jun., reports the following as the result of his examinations of the gas supplied in the east district, during the month of February, by the Sutton, Southcoates, and Drypool Gas Company:—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16'86	16'00	16'50
Grains of sulphur per 100 cubic feet	—	—	23'30
Grains of ammonia per 100 cubic feet	—	—	8'66
Mean barometer and temperature in experiment-room:—Bar., 30'05; temp., 61'66°.			

**RIPLEY GAS COMPANY.**—The annual meeting was held on the 26th ult.—Mr. G. Staley in the chair. The report of the Directors stated that the expenditure for the year on the capital account was £81 2s. 1d., making a total outlay of £10,027 10s. 2½d. The receipts for the year amounted to £2259 13s. 11d. The payments and charges for the year were £1497 9s. 11½d. There was also a balance in the bank for last year amounting to £320 0s. 3½d. The balance for the present year was £1062 17s. 4d., which admitted of a dividend of 9s. 3d. per share. For the first time since the Company were established, owing to the depres-

sion in trade, and a reduction in the price of gas, the revenue had decreased, but it was hoped this would only be temporary. The report was adopted unanimously. Mr. R. M. Storer, of London, and Mr. E. Berry, of Duffield, were re-elected Directors, having retired by rotation. Mr. J. Rangdale, of Ripley, was re-elected Auditor.

**CHICHESTER WATER COMPANY.**—At the half-yearly meeting, on the 28th ult., the report submitted showed that, whereas the total receipts from rates for the year 1876 amounted to £476 0s. 11d., those for the year 1877 amounted to £755 6s. 9d. It was also pointed out that there was still a wide scope for increasing the revenue of the Company, and that much might be done by the Shareholders themselves in hastening the time when the laying on of services from the Company's mains should be general.

**SALES OF PROVINCIAL GAS AND WATER SHARES.**—On the 5th ult. 700 perpetual 5 per cent. Second Preference shares of £10 each, in the Lowestoft Water, Gas, and Market Company, were offered for sale by auction at Norwich. The shares, which were offered in lots of ten each, form part of a sum of £20,000, being an equal fourth part of the capital authorized to be raised by the creation of new shares, under the Lowestoft Water, Gas, and Market Act, 1877, and will be entitled to a dividend of 5 per cent. per annum, payable half yearly, in preference to, and before payment of a dividend on the ordinary shares of the Company. The total realized by the sale was £7263 10s., being an average of £10 7s. 6d. per share. On the 12th ult. 53 shares of £10 each in the Dursley Gaslight and Coke Company were offered for sale by auction at Dursley. Forty-eight of these were knocked down at £15 2s. 6d. each, and five at £15 5s. each. On the 22nd ult., at Lincoln, there were sold by auction two shares of £114 each in the Lincoln Gas and Coke Company. They were sold at £134 each; and three new shares of £50 each in the same concern realized £89 10s. each.

**BELPER GAS COMPANY.**—The half-yearly meeting was held on the 28th ult.—Mr. Hanson in the chair. The Directors in their report stated that, acting in pursuance of the powers conferred by the recent extraordinary general meeting, they had offered 168 new shares for sale. On the 26th of November last the sale produced an aggregate purchase money of £3123 7s. 6d. The whole of the money was paid, resulting in a profit of £1552 7s. 6d., and an addition of 39 shareholders, representing a capital of £1680 in the Company. Contracts for the construction of additional works and plant had been lately entered into, and it was mentioned that the Directors had already increased the consumption of gas by supplying the Local Board with more than double the regular amount. The report was adopted and Mr. Pym's appointment as Auditor was confirmed. Mr. Crossley was re-elected a Director, and Mr. T. Tomlinson, Mr. John Ashton, and Mr. A. H. Hale were also appointed Directors. In consequence of Mr. Ashton, one of the Auditors, having been made a Director, Mr. Thomas Banks was elected Auditor in his place. It was unanimously resolved that a dividend at the rate of 5 per cent. for the half year be paid. A vote of thanks was proposed to the Directors, which was duly acknowledged by the Chairman.

**QUALITY OF THE NEWCASTLE-ON-TYNE GAS.**—Mr. John Pattinson reports the following as the results of his examinations, for February, of the quality of the gas supplied to the borough by the Newcastle-on-Tyne and Gateshead Gas Company:—

Date, 1878.	Illuminating Power in Sperm Candles.	Grains of Sulphur in 100 Cubic Feet of Gas.	Sulphuretted Hydrogen.
Feb. 1	14'8	6'47	Nil.
" 5	15'5	9'02	"
" 8	15'1	8'66	"
" 12	14'5	9'05	"
" 15	15'0	9'59	"
" 19	15'2	7'81	"
" 22	15'4	8'63	"
" 26	15'5	6'15	"

A Sugg-Letheby standard Argand burner is used in testing. According to Act of Parliament, the gas should not be of less than 14 standard candles illuminating power, nor contain more than 17 grains of sulphur per 100 cubic feet of gas.

**EAST ARDSLEY GAS COMPANY.**—The half-yearly meeting was held on the 28th ult.—Mr. T. Beardsworth presided, and, in moving the adoption of the balance-sheet and accounts, referred in feeling terms to the decease of their late Chairman, Mr. Haldane. The Company, he was glad to say, were on a better footing now than they had hitherto been, and the prospect was encouraging. The statement of accounts showed a balance on capital account of £118 5s. 10d., while the profit for the half year amounted to £132 10s. 11d., which, being placed to the reserve-fund, brought that fund up to £333 17s. 3d. The report was adopted, and a dividend of 2½ per cent. per annum, free of income-tax, payable on April 1, was declared.

**MORECAMBE GAS COMPANY.**—The annual meeting was held on the 19th ult.—Mr. James Tetley presiding. The Directors report stated that the profits for the past year amounted to £332 0s. 9d., which allowed them to recommend a dividend of 10s. per share, free of income-tax, on the 1600 shares. The Directors also announced a reduction in the price of gas, commencing on the 1st of January last, together with a discount of 3 per cent. on all accounts paid at the office of the Company within one month from the date of delivery. The Directors had resolved to erect a new gas-holder, to meet increased consumption, and they hoped it would be ready in August next. In order to meet the cost they recommended the issue of 800 new shares of £5, bearing interest at the rate of 5 per cent. for the next three years, to be allotted *pro rata* amongst present proprietors. The report was adopted, and the dividend recommended therein was declared. The meeting was afterwards made special, when the following resolution was passed:—"That the capital of the Morecambe Gas Company, Limited, be increased by the issue of 800 new shares, to the aggregate amount of £4000, to be divided into shares of £5 each."

**BRYNMAWR AND ABERTILLERY GAS AND WATER COMPANY.**—The annual meeting was held on the 28th ult.—the Rev. D. Edwards in the chair. The report, which was adopted, was as follows:—"While trade has been in an exceedingly depressed state, the statement of accounts will probably be as satisfactory as may be expected. The sale of gas at Brynmawr, Nantyglo, and Blaiza has decreased considerably, while at Abertillery there has been some increase in the sale of gas and water. The cost of coal has been less; but the sum received from the sale of coke is very small, that article having been for some time of nominal value, and the large stock now on hand has been valued accordingly very low. More than £260 was paid this year on account of renewals and repairs, extension of mains, &c., the whole being charged to revenue account, no addition being made to capital. After placing £65 1s. to the credit of depreciation, there appears a balance of £450 net revenue, out of which it is recommended that a dividend at the rate of 2½ per cent. be paid, making the dividend for the year 5 per cent., and carrying forward £200, the same as was carried forward last year. There are 72 shares taken from the late Secretary not yet re-issued, which the Directors offer to the Shareholders at the price they stand in for the Company—viz., £9 10s. per share, and which will be entitled to the dividend accruing from the 1st of January last."



**PRICE OF ENGLISH AND AMERICAN COAL.**—The trustees of the Northern Liberties Gas Works use on an average 40,000 tons of coal a year, about one-half consisting of the New Pelton coals of England, which are shipped from Newcastle-on-Tyne. Experiment has shown that a mixture of these coals with those from Westmoreland county, in this State, produce a light equal to that furnished by the Philadelphia Gas-Works and a stronger fuel. The latter merit has reference to the coke which is left after distillation, and it is an important consideration in the manufacture of gas, from a financial standpoint, as it is by this principally that the retorts are heated. "The reason for sending to England for coal, beyond those of good light and fuel," said an officer of the Northern Liberties works, in discussing the subject, "is because we can get it at a much lower rate than that charged here. During the last two years we have been receiving it from 75 cents. to 1 dol. cheaper per ton than Pennsylvania coal. The coal we are getting from England costs us 4 dols. 90 cents per ton, while the Westmoreland coal costs 6 dols. 50 cents. The prices of the former vary, of course, according to the value of gold, as the duties and freight are paid in that coin. We buy coal wherever we can get it at the cheapest rate, and Pennsylvania interests should not have such high rates. There is no reason why they should charge 4 dols. 75 cents per ton for bringing coal from Westmoreland county to the city when we can get it from England at a much lower figure."—*Philadelphia (U.S.) Record.*

**RICHMOND (SURREY) GAS COMPANY.**—The half-yearly meeting of this Company was held on Thursday, the 28th ult.—Mr. F. Chapman in the chair. Mr. E. B. Blott, the Secretary, read the report, which expressed the pleasure of the Directors at finding that after reducing the price of gas 3d. per 1000 feet, they were justified in recommending a dividend for the half year of 5 per cent. on the original capital, and 4 per cent. on the new capital, that being an increase at the rate of 1 per cent. per annum on the new capital, and making for the year 10 per cent. on the old, and  $\frac{7}{8}$  per cent. on the new capital. The Chairman, in moving the adoption of the report, congratulated the Shareholders upon the position of the Company, and referred to the enlargement of the works now in progress. Alderman Grey, of Kingston, seconded the motion, which was unanimously carried, and the dividend recommended was adopted. Messrs. T. M. Clarke and John M' Rae, the retiring Directors, were re-elected, and Mr. John H. Ford was appointed one of the Auditors in the place of Mr. Foster, who had left the neighbourhood. The remuneration of this officer was increased from £10 to £20 per annum. Mr. G. F. Whiteley thought that the Directors who could show them such a favourable balance-sheet were entitled to an increase in their allowance, and he would therefore move that the Directors allowance be increased from £350 to £400 per annum. Mr. Hillier seconded the motion, which was unanimously adopted, and a cordial vote of thanks was accorded to Mr. Eldridge, the Manager.

**GRANTHAM WATER-WORKS COMPANY.**—The half-yearly meeting was held on the 1st ult.—Mr. Ridge in the chair. The report of the Directors was as follows:—"Your Directors have much pleasure in presenting to the Shareholders their statement of accounts for the past half year, which includes all receipts and disbursements for that period. Your Directors notice with pleasure the steady increase which has taken place in the receipts of the Company, and the increased demand which continues to be made for the supply of water to new services. Your Directors are of opinion that the interests of the Company would be materially benefited by the extension of their capital, and beg to recommend that the same be increased from £30,000 to £35,000, by the creation of 500 new shares of £10 each, and that a special meeting of the Shareholders be held on Monday, the 4th of March, for such purpose." The statement of accounts from July to Dec. 1877, was presented and showed the capital account to stand as follows:—Receipts: To amount of paid-up capital, in 3000 shares of £10 each, £30,000; to amount of balance due to Treasurer, £3032 6s. 5d.; total, £33,032 6s. 5d. Payments: By amount expended as per statement,

June 30, 1877, £32,547 17s.; by amount expended on extension and maintenance of works, £484 9s. 5d.; total, £33,032 6s. 5d. In the revenue account the receipts amounted to £4789 2s. 1d. (including balance in favour of the Company, June 30, 1877, £2742 12s. 11d., and amount of water rental for the half year ending Dec. 31, 1877, £1969 0s. 4d.). The payments amounted to £2978 1s. 3d. (including dividends paid Aug., 1877, at 8 per cent., £2400), leaving a balance in favour of the Company of £1811 0s. 10d. The report was adopted; and the retiring Directors and Auditor having been re-elected, the proceedings closed with the usual votes of thanks.

## Register of New Patents.

### APPLICATIONS FOR LETTERS PATENT.

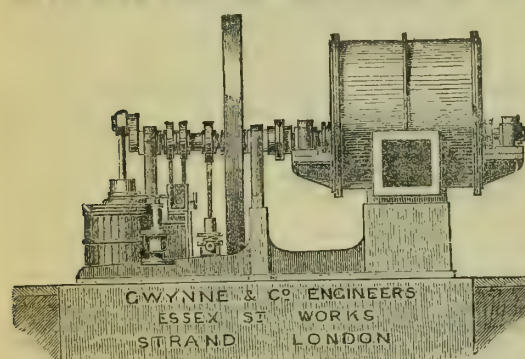
- 732.—WESTON, G., Sheffield, "An improved apparatus applicable to gas governors." Feb. 22, 1878.  
 736.—FIELDING, J., Gloucester, "Improvements in fluid pressure-engines, fluid-meters, and pumps." Feb. 22, 1878.  
 740.—JENSEN, P., Chancery Lane, London, "Improvements in filtering apparatus." A communication. Feb. 22, 1878.  
 755.—PEEBLES, D. B., Bonnington, N.B., "Improvements in apparatus for governing or controlling the flow or pressure of illuminating gas and other fluids, and in part relating to the testing of gas." Feb. 23, 1878.  
 773.—VERCOE, H. B., Holywell, North Wales, "Improvements in pumping apparatus." Feb. 25, 1878.  
 780.—AHRBECKER, H. C., Stamford Street, London, "Improvements in meters or apparatus for measuring or ascertaining the flow of fluids, which improvements are also applicable to obtaining motive power." Feb. 25, 1878.  
 804.—BROWN, P. S., Carrickfergus, Ireland, "Improvements in the obtainment of sulphate of ammonia from ammoniacal liquors, and in the apparatus employed therefor, the said improvements being also applicable for the obtainment of cyanide and sulpho-cyanide of ammonium." Feb. 27, 1878.  
 835.—PARFITT, J. S., King's Heath, Worcester, "Improvements in pressure-gauges." March 1, 1878.  
 850.—KINGHORN, J. G., and COE, W. J., Liverpool, "Improvements in and appertaining to air and circulating pumps, and in valves for the same, parts of which are applicable to blowing and air-compressing engines." March 2, 1878.  
 861.—SCOTT, T. F., Birmingham, "Improvements in apparatus for the production of light by electricity." March 2, 1878.

### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 3333.—SYMONS, W. T., Wednesbury, Stafford, "A fender gas-stove." Sept. 1, 1877.  
 3355.—BERLON, H., FÜRSTENHAGEN, I., and WILDT, H., Bradford, Yorks, "Improvements in filters and the fittings connected therewith." Sept. 4, 1877.  
 3356.—HARDING, T. R. and T. W., Leeds, Yorks, "Improvements in the manufacture of drills, rymers, screwing-taps, and other similar articles." Sept. 4, 1877.  
 3364.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in liquid-meters." A communication. Sept. 4, 1877.  
 3395.—STANDEN, B. B., Bradford, Yorks, "Improvements in the treatment of human excrement, both solid and liquid, and in the deodorizing of organic matter, and in the means or apparatus employed therein; part of such means and apparatus may be employed for treating sewage matter, and filtering and deodorizing sewage and other water." Sept. 6, 1877.

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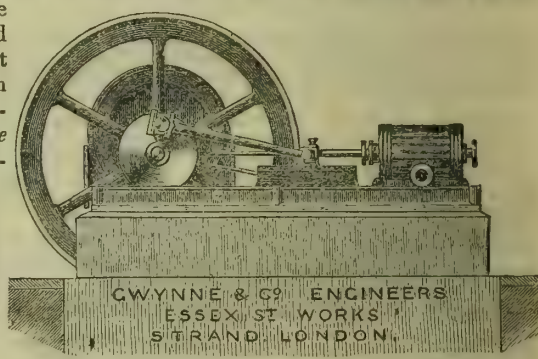
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## TAY WORKS, BONNINGTON, EDINBURGH.



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TO CORRESPONDENTS.

- J. P., Weston-super-Mare.—*The Gas-Works Clauses Act, 1871, which the Court of Queen's Bench has decided is applicable to all Companies whose Special Acts incorporate the General Act of 1847, provides that the annual accounts filed with the Clerk of the Peace shall be made up to the 31st of December in each year. The Bill of the present session adopts the same provision, and schedules similar forms of account.*
- A COUNTRY SECRETARY.—*The decision in the case of the "Commercial Gas Company v. Scott" distinctly affirmed that the Act of 1871 was binding on every Company whose Special Act incorporated the Act of 1847. This decision, inconsistent as it may appear, has never been appealed against. We believe, however, that an attempt will be made to introduce a clause into the Gas-Works Clauses Bill of the present session, which will declare that the Act of 1871 does not apply to any Company whose Special Act does not incorporate that enactment.*
- W. S., Darlington.—*The reports you sent, arriving, as they did, only yesterday morning, are too long for insertion this week, but shall appear in our next.*
- R. S., Horsham.—*Thanks for calling attention to these cases.*
- J. H., Glastonbury.—*Next week.*
- RECEIVED.—*"Annual Report by the West of Scotland Association of Gas Managers, containing information relative to the Gas Supply of Scotland, 1877-78."*—"Common Sense for Gas Users." Second Edition. By Robert Wilson, C.E.—*"Dip-Pipes and Hydraulic Mains versus Desiccated Coal Gas."* By William White.

THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 19, 1878.

Circular to Gas Companies.

THE present position of the question as to the purchase of the Water Companies by the Metropolitan Board of Works, not unnaturally reminds us of what happened when the Board attempted the purchase of the Gas Companies. Then, as now, the Board were foiled in their attempt to confiscate, but, with the assistance of the House of Trade, they succeeded in imposing

terms on the Companies who promoted Bills, which may, in the end, prove advantageous to the general public. All the Metropolitan Companies who may seek further parliamentary powers, will be compelled to submit to the same enactments; Metropolitan Gas Legislation may be said to be stereotyped. The Board of Trade have, indeed, had it so far their own way that gas legislation will be very much the same all over the kingdom. But in one, and an important respect, the recommendations of the Board of Trade have been neglected. Nothing could have been much more emphatic than the advice the Board gave to the Companies to amalgamate, but amalgamation seems to have come to an end. It is not likely that the Metropolitan Board, while they exist, will make another attempt to confiscate the Gas Companies; but the advantages which amalgamation would confer in case of attacks from other quarters, remain indisputable. It may be taken as certain, that London will not much longer exist without some complete form of municipal government. Sir U. Kay-Shuttleworth has given notice that, on April 5, he will, among other things, call the attention of the House of Commons to the state of local self-government in the Metropolis, and move, *inter alia*, that, in the opinion of the House, the whole of the Metropolis should be united under one administrative authority, directly representing the ratepayers, and so constituted as to command general confidence, and further, that these conditions are not fulfilled under the present system of administration, partly by Vestries and District Boards, partly by the Metropolitan Board of Works, partly by Companies trading in Water and Gas, while the functions of the Corporation are confined within the narrow limits of the City. Sir U. Kay-Shuttleworth is inclined to believe that the functions of the Corporation of the City of London, extended all over the Metropolis and adapted to modern wants, would be a remedy for all existing evils, and he recommends Her Majesty's Government to undertake the needful reform. At the present moment, he is preaching to deaf adders; but the day will assuredly come when the government of the Metropolis will be the question of a parliamentary session. Then will be the time of trial for Metropolitan Gas Companies. The day may be a little distant, but it would be well for the Companies to prepare for it. They can only effectually meet a complete Municipality by a complete amalgamation. All the benefits which it is alleged can be secured by unity of management under a Corporation, can be still better procured by unity of management under those who have so long had the direction of the business. Parliament, we believe, would see this, and, in view of the enormous amount of labour which would devolve on untried hands, if the undertakings were transferred, would decide to leave them to the care of those who brought them to so much success. In time of peace prepare for war, may now be justly urged upon the Gas Companies. The day of trial, as we say, may be distant, but it will certainly come, and we can only, once again, urge upon the Companies the advantages they must derive in a struggle by a consolidation of their interests.

The Lord Chancellor's Bill to consolidate, with amendments, the general Acts of 1847 and 1871, is to be read a second time on April 1. At the present moment, no motion stands on the papers of the House to alter any of its provisions; but this may be urged, that the Bill should not be allowed to pass without the introduction of a clause, enacting that the provisions of the Act of 1871 should not apply to any Company whose special Act does not incorporate that Act. The objections of the Metropolitan Board, however, may possibly be ventilated by Viscount Middleton, or some other ardent admirer of the Board; but in the face of the overwhelming majority the present Government can command, the Bill is tolerably certain to be passed almost in its integrity, and we shall not regret it.

The half-yearly general meeting of the Crystal Palace District Gas Company will be held on the 21st inst. The accounts show very favourable results for the past six months working. The Directors propose maximum dividends on all classes of stocks and shares, which, when paid, will leave a small balance to be carried forward to the next half year's accounts. So good do the prospects of the Company appear, that the Directors announce a reduction of twopence per thousand feet from Lady-day. This will make the price of gas in the Company's district 3s. 10d. per thousand feet.

We are happy to announce that the Gas Committee of the Corporation of Birmingham propose to hold, in the month of June next, an exhibition of gas apparatus for culinary and other domestic purposes, independent of illumination. Our readers know the warm approbation we have always given to displays of this kind, believing, as we do, that their tendency is to enhance the value of gas property, by promoting increased consumption. Our desire is to see, notwithstanding difficulties which might be created in some existing works, the summer consumption of gas



equal to the winter. Many advantages would result from this. The stokers would be kept together throughout the whole year, and increased consumption must necessarily enhance profits. Birmingham is exceptionally favourable for this kind of exhibition, and, although the apparatus of some eminent manufacturers in the borough are well known throughout the length and breadth of the kingdom, it may be that, after all, their advantages are but little known in their own locality. Perhaps it would be as well if the Gas Committee at the same time made a display of good and bad burners, for gas consumers require much instruction in the choice of these instruments. We might also counsel a display of meters in action in glass cases. The meter is a box of mystery, which, ill understood, is a source of dissatisfaction in Birmingham and elsewhere. If an intelligent mechanic saw the beautiful simplicity of its action, he would no longer doubt the accuracy of the consumption it records. We need hardly say that we wish the Corporation every success in their exhibition, which cannot fail to be beneficial to gas interests, whether those are Corporations or Companies.

The Harrow Gas Company, we are happy to say, continue to make progress. Very considerable increase in consumption has taken place in the course of the past half year. In view of the fact that so much of the Company's district is sparsely populated, this increase is eminently satisfactory. A dividend at the rate of five and a half per cent. per annum has been declared, and a small balance has been carried forward.

We are not at all alarmed at hearing that the City Commissioners of Sewers have determined on giving the electric light a trial. There is one particular situation in which, possibly, the light may be used with advantage—that is, opposite the Mansion House, where life and limb are nightly risked for want of illumination. As we have many times said, we have no fear of the competition of the electric light in the strongholds of Gas Companies, and we confess to a great desire to see certain centres in London streets better illuminated.

We have before reported that the opposition to the Bill of the York United Gas Company in the Town Council had collapsed. The measure has been reported to the House of Lords, "Opposition withdrawn," but Mr. Leeman, M.P., has been making mischief with Earl Redesdale, and has succeeded in persuading his lordship to defer the consideration of the Bill for a few days. We do not believe it at all matters; for, with the concessions which the Company have made, we feel satisfied that there is nothing in the measure, as it now stands, to which Earl Redesdale would object. Misled by Alderman Leeman, M.P., we speculated on the possibility of the Government introducing a measure to facilitate the compulsory purchase of Gas and Water Companies by Local Authorities. Mr. Leeman has been at the pains to sound the Government on the subject, and has found that they have no intention to bring forward such a measure. The designs of the present Board of Trade to crush Gas and Water Companies cannot, it seems, be supported to this extent; and for so much we may be thankful.

We expect that the undertaking of the Exeter Gas Company will presently pass into the hands of the Corporation. A Sub-Committee, who have been watching the Company's Bill, have recommended the Corporation to enter upon direct negotiations, and before the measure reaches the Commons, there can be little doubt terms will be arranged. We shall be sorry to see the Company disappear; but the Bill of indictment against them is long. We fear we shall never be able to congratulate the Corporation of Exeter upon getting a bargain; but it seems possible that, under new and improved management, Exeter may be more cheaply lighted, and the neighbourhood of the works rendered sweeter.

The Lichfield Gas Bill, we are happy to say, will proceed without further opposition from the Corporation, the Company having made some concessions which have satisfied the local magnates.

Notwithstanding the reduction in the price of gas made by the Bristol Gas Company, their profits for the past half year have been sufficient for the payment of full dividends, leaving a balance to be carried forward. We are glad to learn that the new works designed for the Company will soon be commenced, as the manufacturing capacity of the present works is now inadequate. The Tynemouth Gas Company also pay full dividends, and carry forward a good balance. In their case, a reduction of threepence per thousand feet all round is announced.

We mentioned last week that the Gas Committee of the Corporation of Wigan were preparing a counterblast to Mr. R. C. Templeton's pamphlet. Some such document, it seems, has been prepared, but it has been referred back to the Committee for reconsideration. Why a statement of accounts extracted from ledgers should require reconsideration is best known to the Gas Committee of the Corporation of Wigan. In the meantime, a

very paltry revenge has been taken upon Mr. Templeton. His gas has been cut off, and his meter carried away, although his account is only three weeks overdue. It seems there may have been some mistake made, but the Corporation officials declined to admit it.

It may be a moot point whether the Corporation of Wigan do, or do not, make a profit by their gas undertaking; but it would seem clear that their neighbours, the Local Board of Hindley, who a few years ago obtained possession of the gas-works, have not particularly succeeded in managing them profitably. In the course of the past year the Board have lost £4000 on their undertaking. The most important consequence to consumers is, that the Board are now deliberating whether or not they shall raise the price to the maximum allowed by their special Act. It seems certain that some increase in price must take place, and it will, no doubt, be advanced to the maximum of 5s. per thousand feet. In case this should not prove sufficient, the Local Board have power to levy a special gas-rate of a shilling in the pound. It will be hardly believed, but it is set forth in the report of the Town Clerk, that the unaccounted-for gas amounts to over 30 per cent. of the make. Management such as this need not be characterized.

Dissatisfaction with the Gas Company continues to be expressed at Hastings, and among other projects discussed in the Town and Council, is the establishment of a new Company, to compete with the old one. This is a dream which Local Authorities are continually indulging in, but it is never realized. Parliament never sanction competing Gas Companies; they study too well the interests of capitalists, consumers, and ratepayers.

The Ilkeston Local Board have decided on purchasing the undertaking of the Ilkeston Gas Company, and have applied to the Local Government Board for power to borrow £25,000 for the purpose. We have no knowledge of the consideration to be paid. The works, we believe, have been very much starved, and will probably require considerable extension at the hands of the Board.

Our "Legal Intelligence" shows that the Insurance Companies have gained a verdict against the Brighton Corporation for the damages occasioned by the explosion of gas at the corner of Market Street. The evidence adduced showed conclusively that a fracture of a gas-pipe was occasioned by an exceptionally heavy steam-roller, which rested over the spot where the fracture took place. The amount of the damages is to be assessed by an arbitrator.

As a matter of course, we continue to receive correspondence relative to the affairs of the British Association of Gas Managers, which, for a reason given in our last, we must decline to insert. Caustic and comic sketches might be amusing to some of our readers, but on this matter we consider them unadapted for the pages of the JOURNAL. We, therefore, adhere to our resolution, and recommend our correspondents to forward any suggestions they have to make to the Committee of the Association.

A Company has been formed, under the title of the Imperial Water and Gas Corporation, Limited, the object of which is to afford efficient supplies of water and gas to towns and villages in the United Kingdom and elsewhere. The Company is brought forward under most excellent auspices, the Directors being gentlemen of established reputation. We have, unfortunately, no space this week to refer to the details of the scheme, but shall take an early opportunity of making further remarks upon the matter.

### Water and Sanitary Notes.

At a late hour last Tuesday night, Sir J. M. Hogg rose in the House of Commons to move the second reading of the Metropolitan Water-Works (Purchase) Bill. The debate was subsequently adjourned, before the opinion of the House on the question could be fairly ascertained. It is fixed to be resumed on Friday next; but it is very doubtful whether it will be continued on that night. The Government decline to give a night for the discussion, and, without their assistance, we do not see how the measure can make progress, or, as it is more likely, have its progress entirely stopped. If the debate be not resumed before the Easter recess, we shall consider the Bill shelved for the present session. It may hang about on the paper; but the better course would be for the Metropolitan Board to withdraw it at once.

Last Tuesday the debate was opened by a speech, weak even for Sir J. M. Hogg. He went in a disjointed manner over all the well-known statements that have been made as to the badness of the quality of the water supplied to the Metropolis, and used, not very fairly, all he could find for his purpose in some well-known Blue Books. There was certainly nothing in



the speech of the honourable gentleman to induce the House to accept his motion. He was followed by Mr. Samuda, who, in a closely reasoned speech, successfully demolished everything that could be called argument in the address of the previous speaker. The financial part of the question, which was left untouched by Sir J. M. Hogg, was put fairly before the House by Mr. Samuda, who showed that anything but advantage to the ratepayers would result from the transfer of the undertakings to the Metropolitan Board. In this view he was supported by Alderman Cotton, who, as Member for the City of London, spoke, it may be presumed, on behalf of the Corporation. His colleague, Mr. Goschen, in supporting the adjournment of the debate, expressed a hope that the Bill would not be brought on again, unless time could be given for a full discussion. Mr. Fawcett, who took some pains to conceal the way in which he ultimately meant to vote, but who left little doubt upon the minds of his hearers that he intended to support the second reading, also advocated the adjournment of the debate. The Chancellor of the Exchequer said, in reply to the several appeals made to the Government, that he could hold out no hope of being able to give up an evening; and so, for the time, the curtain falls on the Metropolitan Water-Works (Purchase) Bill.

If we attempted to gauge the opinion of the House, we should say it is fairly divided on two points—that is, whether the water now supplied is good and wholesome, and whether or not the Metropolitan Board are the proper authority to entrust with the supply. It is remarkable that the administration of the Companies was not impugned by any speaker. Doubtless, if the debate be resumed, we shall hear something of excessive rating on new valuations; but, perhaps, least said on this matter on the part of the Metropolitan Board the better. Their rating powers would be equal to those now possessed by the Companies, and would be considerably added to in the shape of authority to levy a public rate. It is needless, however, to speculate; we fancy the Companies have still a long career of usefulness and reasonable profit before them.

That extraordinary scheme, concocted under the name of the South London (Spring) Water Company, which proposed to distribute water from a well at Streatham over a district extending from the westerly portion of Kent to Esher in Surrey, has, as we expected would be the case, been dropped. We may presume that the promoters of this notable scheme found the purse-strings of investors rather tightly drawn.

An arrangement has been come to between a Committee of the Town Council of Cardiff and the Directors of the Cardiff Water-Works Company, in virtue of which a clause is to be introduced into the Company's Bill now before Parliament, authorizing the Corporation to purchase the undertaking within twelve months of the passing of the Act. A further step has, indeed, been taken. A provisional agreement has been entered into, which fixes the consideration to be paid for the works at a round sum of £300,000. This amount, it would seem, represents the present market value of the share capital and stock, plus twenty-five per cent. for compulsory purchase. The arrangement, of course, needs confirmation by the Town Council, and ratification by the ratepayers. As the idea of the purchase is popular in the borough, we have little doubt the provisional arrangements entered into will be carried out.

The Directors of the Bristol Water Company will recommend to the Shareholders at their next meeting a dividend of ten per cent., with a bonus of 5s. on the £25 old shares, to make up back dividends.

The Ilkeston Local Board, worried under the Rivers Pollution Act, have decided on setting up a sewage farm, there being, if we understand rightly, a combined system of treatment by precipitation and irrigation. They have also decided on purchasing the existing water-works, and enlarging and improving them. No opposition is raised to either scheme; and it seems certain that the Local Government Board will grant all the borrowing powers asked for.

WOOLWICH, PLUMSTEAD, AND CHARLTON CONSUMERS GAS COMPANY.—The forty-seventh half-yearly meeting of this Company was held on Wednesday, the 27th ult.—Mr. John Hammond in the chair. The accounts for the half year ending Christmas last showed a profit of £2900; and out of this it was resolved to declare dividends of 10½ per cent. on the original shares, and 8½ per cent. on the new shares. These are three-fourths per cent. more than has ever been paid before, and are the result of the Act which the Company obtained last year, and which fixed the standard price at 4s. per 1000 feet for 14 candle gas. It is announced that the price of gas will be reduced to 3s. 6d. per 1000 from April 1 next, and an allowance of 8s. per lamp allowed to the parishes for each public lamp. At the meeting, the retiring Directors—Messrs. Plaisted, H. Shersby, W. Stuart, M.D., and Joseph Cohen—were re-elected, and votes of thanks given to the Directors, Secretary, and Engineer of the Company. A proposition of Mr. Edwin Hughes to make a special grant of 150 guineas to the Parliamentary Committee, in acknowledgment of their extra services in getting the Act above referred to passed, was not well received, and was allowed to drop. An understanding was come to that the matter would be introduced at the next half-yearly meeting, after notice had been given to the Shareholders.

# A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLXI.

PUBLIC LIGHTING (continued).

The name of Mr. W. Sugg has long been associated with efficiency in public lighting, and with instruments of precision in connection with gas lighting generally. His well-known dry governor is shown in the annexed views, fig. 28 being an elevation, and fig. 29 a

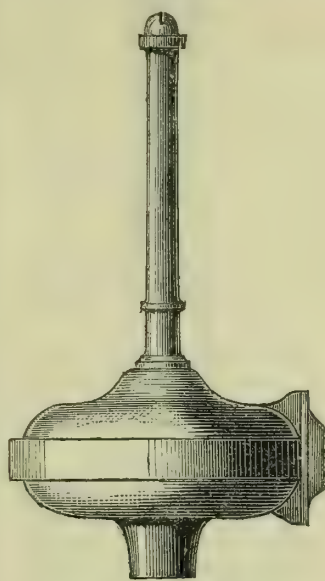


FIG. 28.

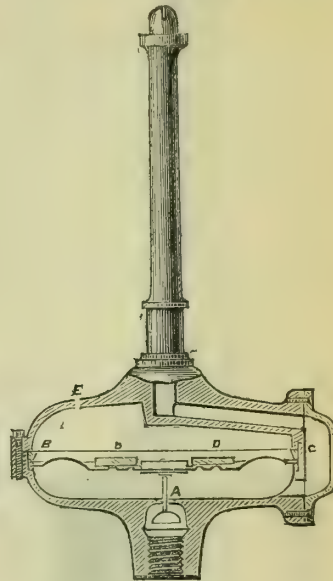


FIG. 29.

section. The inlet is screwed to fit the ordinary 3/8-inch gas thread. A is the regulating valve and spindle, attached by means of two shields to the leather diaphragm. B is a metal ring, which is screwed into the case of the governor, and holds the leather firmly to its seat. Between the leather and the metal ring is a card washer, which protects the former from injury in tightening the screw down to its bearing. C is the gas-way leading from the lower division of the governor to the burner tube, and thence to the steatite burner tip. The annular leaden weight used in adjusting the apparatus is shown at D; and E is a hole communicating with the atmosphere to allow the diaphragm to rise and fall according to the degree of pressure to which it is subjected. This orifice requires to be kept clear, otherwise the valve will cease to operate. This lamp-governor is more extensively used than any other, both in this country and abroad.

The governor made by Messrs. D. Bruce Peebles and Co., represented in the subjoined figs. 30 to 33, has grown rapidly in estimation

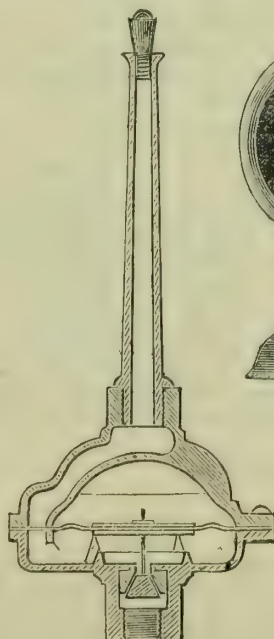


FIG. 30.

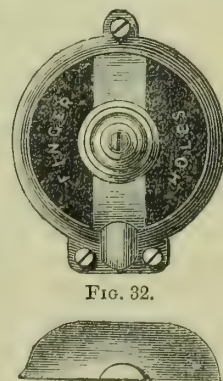


FIG. 31.

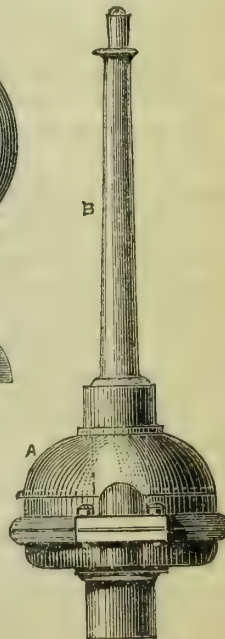


FIG. 32.

as an accurate and useful regulator. It is simple and durable in construction, and can be readily adjusted when required. The cap, A, and burner tube, B, are of brass, and the case is of cast-iron. The adjustment is effected by removing the brass cap, which can be done without interfering with the burner and tube; weights are then put on or taken off until the desired pressure is obtained. Its diameter is reduced to the minimum so as to obviate, as much as possible, any disagreeable shadow in the vicinity of the lamp-post. Fig. 30 is a sectional elevation, showing the construction and action of the governor. Fig. 31 is an elevation complete, the small inverted spout at the side of the cap serving the double purpose of admitting air to the upper surface of the diaphragm, and throwing off any rain water that may have entered through the openings in the lamp. Fig 32



represents a plan with the brass cap removed, showing the finger-holes by which access is had to the inside, this being obtained without taking the instrument to pieces. Fig. 33 is the brass cap. Altogether, the governor is one of the most perfect of its kind.

The rheometer, or flow-measurer, of Mons. H. Giroud, is represented, full size, in figs. 34 and 35, the one being an elevation of the instru-

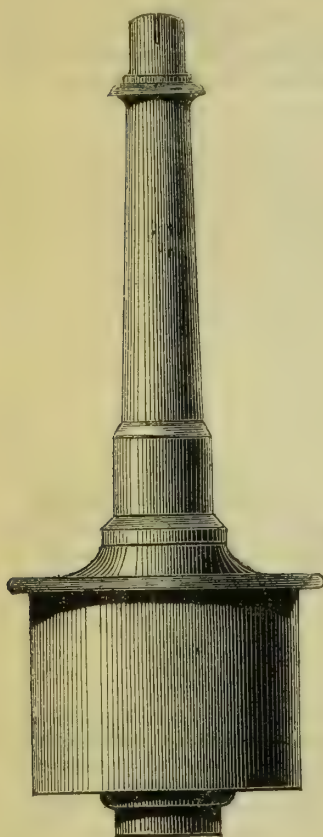


FIG. 34.

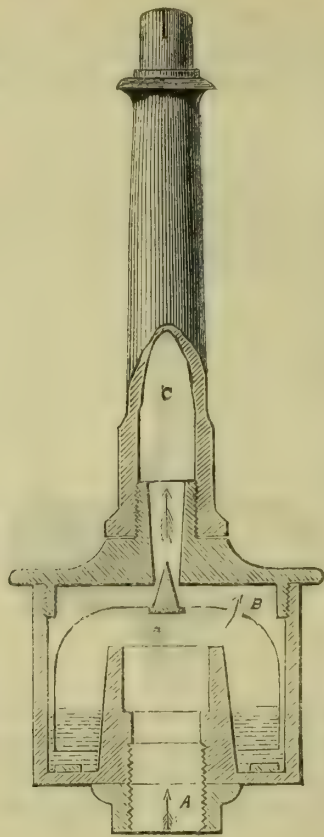


FIG. 35.

ment, and the other a sectional view. A more correct designation of this ingenious apparatus would be "measurer or regulator of volume," as it is this characteristic that distinguishes it from other governors which are regulators of pressure. Mr. Peebles has pointed out\* that the volumetric governor invented by Mr. John Leslie in 1841, is identical in principle with that of Mons. Giroud, consisting, as it does, of an inverted bell placed in oil, and having a cone fixed on the dome of the bell, working in a seat placed in the cover of the casing. The bell is sustained between two pressures having a constant unvarying difference. Although the principle of both is the same, we cheerfully accord to Mons. Giroud the merit of originality in the discovery, as he was unaware of what had previously been done by Mr. Leslie; and the further credit is due to him of making the apparatus of a size and form suitable for application to single jets.

The rheometer consists of a metal cylinder, with a screwed cap or cover, to which a tube, C, is attached, surmounted by the burner or jet. Inside the cylinder is a metallic bell, placed in a circular channel, partially filled with glycerine. The bell is pierced with an orifice, B, with a conical valve on its summit working in the opening in the cover. When the gas enters, it raises the bell, and, at the same time, passes through the small hole pierced in its crown. The pressure is thus established on the upper surface of the bell, and the cone acts by diminishing or increasing the gas-way through the cover, according to the variations of the pressure. Whatever such variations may be, they are equalized, both above and below the bell, in such a manner that its orifice, in respect of gauge, delivers the gas at a constant pressure, according to their difference, which is that due to its own weight. The following establishes the theory of the rheometer:—

Let P = the pressure of the gas below the bell.  
 P' = the pressure above the bell.  
 R = the weight of the bell; and  
 S = the horizontal section.

Then, the bell being in *equilibrium*, the force due to a pressure below becomes evidently equal to that above, increased by the weight of the bell. Hence the equation:—

$$\begin{aligned} PS &= P'S + R \\ PS - P'S &= R, \text{ and} \\ P - P' &= \frac{R}{S} \end{aligned}$$

The difference of the two pressures above and below the bell is therefore constant; consequently, the volume delivered by the orifice, B, is also constant.

Hence the rheometer delivers a constant volume of gas to the burner under all pressures, the delivery being independent of the size of the jet.

(To be continued.)

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### GAS PROPERTY, GAS ENGINEERS, AND THE YORK GAS COMPANY.

SIR,—Of all the enterprises that have conferred blessings upon humanity, none, perhaps, deserves a more kindly recognition than gas enterprise; and yet, strange to say, none receives less. Legislation has almost exhausted itself with enactments of one sort and another, until gas laws, and gas regulations, and gas restrictions are a perfect puzzle, even to the initiated. In every Town Council there is an anti-gas section, ready at any moment to have a fling at the poor Gas Company, and ready, I am sorry to say, in some instances, to treat the Gas Shareholder—the man who has found the needful, and risked it to give the benefits of gaslight to his fellow-townsmen—as if he were an enemy to society. So much, indeed, has this feeling of late years been fostered, that little politicians and stump orators everywhere seem fast drifting into the idea that Gas Directors and Gas Shareholders are merely a set of banditti, and should be treated as such. Of course, in making these remarks, I do not for one moment assume that a Gas Shareholder is more magnanimous or less selfish than any other shareholder; he invests his money for the interest he gets, or hopes to get. I merely, as a Gas Shareholder, ask for fair play. My real object, however, in drawing attention to this subject, is to correct an impression that seems to be, more or less, general—that the interests of Gas Shareholders are antagonistic to the public interest. Now, whatever they may have been, I think it can be clearly shown they are not so now. Modern legislation has not only robbed such antagonism of any advantage to the Gas Shareholder, but, in holding the scales of justice, it has, perhaps, just given the "tilt" in favour of the public. Mr. Woodall, of the Leeds Corporation Gas-Works, whom, along with Mr. Stevenson, Gas Engineer, of London, the Corporation of York recently consulted in their quarrel with the Gas Company, seems to think otherwise. Let us see how he proves his case.

The main points left in the dispute between the Corporation of York and the Gas Company were the fixing of the maximum price for gas, and the standard illuminating power. Hitherto the Gas Company have not been under any restriction of price, and yet they are only charging 2s. 6d. per 1000 cubic feet, and giving a gas of from 15 to 16 candles. The Gas Company, in their Bill, asked for a maximum of 3s. 9d., and proposed the usual standard, for coal gas, of 14 candles. The Corporation wanted a maximum price of 3s. 6d., and a gas of 16 candles. This the Company refused, but, by way of inducing a settlement, offered to reduce their maximum price to 3s. 6d. Here is Mr. Woodall's reasoning upon this point. He says: "I am of opinion that this (maximum) price should not be fixed so high as to remove the conduct of the Gas Company beyond the influence of commercial principles, and that the price should be so low as to produce an element of risk, and to necessitate enterprise, economy, and efficiency on the part of the Company." Why did not Mr. Woodall give a definite opinion as to what the maximum price ought really to be, instead of simply stating that it should "be so low as to produce an element of risk" to the poor Shareholder. The York Gas Company have offered, in their Bill, to reduce the rate of interest upon their new capital to 5 per cent., and surely that is not a rate of interest that should be put in jeopardy and "risk." If so, I am decidedly of opinion that gas enterprise must soon come to an end. After stating that "as a matter of policy, Companies have generally sought for the largest addition (to capital, I suppose) obtainable without exciting surprise or suspicion on the part of the community, and in the interests of their proprietors," &c., Mr. Woodall adds: "It is in consequence of the heedlessness of the public in certain districts in regard to this matter that many cases can be cited of a high maximum price," &c. Then he recommends that the Gas Company "should only be permitted to acquire such an amount of additional capital as would meet their necessities for ten years;" Mr. Leeman supplementing this by stating that Mr. Woodall advised the York Corporation "that £20,000 would be enough for the present purposes of the Gas Company." This, forsooth, Mr. Woodall advised, although he had never seen the York Gas-Works, and knew literally nothing about the Company's plant, either for present purposes or the immediate necessities of the future. Again I say poor Gas Companies; and well, indeed, may I say "poor," when, in the face of the fact that gas property is done to death with tinkering legislation, a Gas Engineer recommends that each Gas Company shall be compelled to go to Parliament for fresh powers—and be exposed to litigation and contention and arbitration—every ten years.

Now, with regard to the past policy of Gas Companies, I have already said that Gas Shareholders are neither better nor worse than other Shareholders, and however *à propos* the insinuations Mr. Woodall has used may be upon Gas Companies not under modern law, they certainly are unnecessary where Companies, like the York Gas Company, are seeking fresh powers. Under existing legislation, where all new capital is sold by auction, and the premiums actually given for the benefit of the public, there is not one tittle of inducement for Companies to get "the largest addition (of capital) obtainable," or to spend money that will not pay, for not one penny of profit can go into the pockets of the Shareholders. Indeed, the law is so plain upon this point that it seems idle to waste words about it, and, therefore, to fix a maximum price that would "risk" the dividend upon existing capital would be manifestly an act of gross injustice.

With reference to the ground on which the York Gas Company justified their maximum price—viz., the uncertain future of the price of coals—Mr. Woodall's report runs: "It is highly improbable that a coal famine more extreme than the last can ever occur again, and we know that an addition, to prices current at that time, of about 10 per cent. sufficed to yield the maximum dividend. Ten per cent. on 2s. 6d., the present price, is only 3d. It is, therefore, most unreasonable to ask for as much as 1s. 3d." I confess that with the fore part of this paragraph I feel somewhat foggy, as I cannot, for the life of me, conceive how it can be so highly improbable that a coal famine "more extreme than the last can ever occur again." I should have thought that that which never has occurred could not possibly occur "again." But then Mr.

\* See paper on "Gas Governors," read by Mr. Peebles before the North British Association of Gas Managers, July 14, 1876. JOURNAL OF GAS LIGHTING, Vol. XXVIII., p. 204.



Woodall, as Mr. Leeman, M.P., says, is a "practical man," and, of course, must know what he is talking about. Mr. Woodall next says that an addition of 10 per cent. to the prices of gas prior to the coal famine "sufficed to yield the maximum dividend." Where? Let Mr. Woodall, or anybody else—if anybody else can be found—reply. Besides, Mr. Woodall admitted to the Gas Committee of the York Corporation that an increase in the cost of coal of 5s. per ton would involve, to meet such cost, an advance of 6d. per 1000 feet in the price of gas. How, then, does he reconcile the mere 10 per cent. increase, or 3d. per 1000 feet in the price of gas, when it is a fact that coal is now full—nay, over—twice 5s. per ton less than in the coal famine; equal, in other words, to 1s. per 1000 feet in gas, or full 40 per cent. advance. As I said before, Mr. Woodall is a "practical man," and, therefore, may be able to explain this; I cannot. Even in York, under a favourable contract for coals, the price of gas in the coal famine had to be raised 33 per cent.—i.e., from 2s. 6d. to 3s. 4d. In York the price is now 2s. 6d.; and Mr. Woodall correctly says 10 per cent. is only 3d., and then adds it is "most unreasonable to ask for as much as 1s. 3d." The York Company distinctly said, and showed by their balance-sheet, they were not living at 2s. 6d., and that they had to make up their dividend last half year from surplus profits. The price at which they could live is 2s. 8½d., and this, in all fairness, was the price for Mr. Woodall to deal with.

And bearing upon this question of price, and the demand of the Corporation for 16-candle gas for a 14-candle price, hear what Mr. Woodall said in January, 1877, in a report to the Leeds Corporation, upon the request for an increase of 2-candle power in the Leeds gas. He says, after referring to the fact that gas is now used for "many purposes (cooking and heating) other than lighting," and that, therefore, "the price should be kept down to the lowest limit consistent with the reasonable requirements of the public," that "beyond all, I submit that it is unreasonable to increase the quality of gas by 2 candles, at a cost of not less than £10,000 a year," when, by proper attention to burners, "any person may derive the full value of 16 candles," or, in some cases, "treble the advantage" of the Leeds gas which they usually get. Then, after showing that the increased illuminating power could only be appreciated upon one-third of the quantity of gas made, stated that the real increased cost of effecting an additional 2-candle power in such of the Leeds gas as was really used for lighting purposes, would be 4.23d. per 1000 feet. And, if this is so in Leeds, why should Mr. Woodall not apply the same rule to the York gas?

Mr. Stevenson did go to the gas-works, and he had an interview of two hours with Mr. Sellers, the Company's Secretary, and, after discussing the various questions involved, admitted that "an advance of 10s. per ton in the cost of coal would absorb the difference between 2s. 9d. (the present really necessary price of the York gas) and 3s. 9d.," the maximum the Company at first proposed, and which Mr. Stevenson "was not prepared to say was too high."

Whether Mr. Woodall is a "practical man" or not I will leave it, as I will leave to the judgment of your readers as to which report is the more impartial and logical.

York, March 15, 1878.

A GAS SHAREHOLDER.

#### COMMISSIONS.

SIR,—On the 12th inst., in answer to a question in the House of Commons, the Home Secretary said he had decided to bring in a Bill on the subject of frauds by fiduciary agents.

Would it not be well for receivers and givers of commissions to discontinue the practice forthwith, rather than wait to be "made moral by Act of Parliament?"—a mode of reformation which has become imperative to all, because most refuse to give ear to the "still small voice" within.

INQUIRER.

ALFORD GAS COMPANY.—The half-yearly meeting was held on the 26th ult.—Mr. C. F. Anderson in the chair. The revenue account showed that £565 16s. 4d. had been received for gas and meter rents during the half year, £66 3s. 9d. for public lamps, and £145 18s. 9d. from the sale of coal tar and coke, leaving £331 7s. 3d. in favour of the Company. The profit and loss account showed that a sum of £105 10s. 9d. was the balance of the previous account, which, with the revenue balance of £331 7s. 3d., made up the credits to £436 18s. After deducting interest on mortgage loan—£69 8s. 4d.—and bank commission—8s. 6d.—there remained a disposable balance of £367 1s. 6d., being a little over 2½ per cent. for the past two years. No dividend was declared in 1876, the state of the finances not warranting that step. Three per cent., however, was declared in August last, and out of the disposable balance of the past half year it was determined to declare a further dividend of 2 per cent., so as to make a dividend of 5 per cent. for the year 1877. It was determined to reduce the price of gas on and after the 1st of April, but the amount did not transpire, notice of the reduction being promised during the present month.

COLCHESTER GAS COMPANY.—At the half-yearly meeting of this Company, the following report was received and adopted:—"The Directors are happy to announce an immediate reduction in the price of gas. The circumstances of the Company with reference to their charge for gas have been peculiar, and have made it necessary to maintain a higher rate than that charged at the present time by other Companies. This state of things is easily explained. During the continuance of the coal famine, almost all other provincial companies availed themselves of the powers vested in them by their Acts to increase their price 9d. and 1s. per 1000 feet, whilst this Company, possessing no such privilege, were unable to make an addition of a single fraction until enlarged statutory powers were obtained. We were thus working at a great disadvantage throughout the entire period of the unprecedentedly high price of coal. By the time we had succeeded, at a cost of more than £2000, in our application to Parliament for an amended Act, the coal market had been restored almost to its normal state; but we, having expended our money to meet famine prices, and lost an entire year's dividend, were driven to increase our gas-rentals at the very time when other Companies began to abate their additional charges. It must also not be forgotten that although Parliament granted us the power to increase our rate 9d. per 1000 feet, we only made an advance of 6d. not more than half that which had been made by many Companies, and which they maintained for a considerable period. The reduction now announced will be at the rate of 3d. per 1000 cubic feet, to take effect in April next. The Directors recommend the Shareholders to declare a dividend of 10 per cent. upon the old share capital, and 7 per cent. on the new, payable on the 1st of March."

## Parliamentary Intelligence.

### HOUSE OF LORDS.

MONDAY, MARCH 11.

A report was read from the Select Committee on the York United Gas Bill that the Committee had not proceeded with the consideration of the Bill, no parties having appeared in opposition thereto.

A petition against the Trowbridge Water Bill was presented from Inhabitants, owners, &c., of property, and ratepayers in Bradford, Wilts; and petitions in favour of it were presented from (1) Inhabitants of Trowbridge, (2) Inhabitants of Bradford-upon-Avon, (3) Owners, &c., of property in Bradford-upon-Avon.

TUESDAY, MARCH 12.

A report was read from the Select Committee on the Lichfield Gas Bill, that the Committee had not proceeded with the consideration of the Bill, no parties having appeared in opposition thereto.

Bills reported with amendments:—Forfar Water; Sutton-in-Ashfield Gas. Bill read the third time, passed, and sent to the Commons:—Dublin Water-Works Acts Amendment.

Petitions in favour of the Trowbridge Water Bill were presented from (1) Inhabitants of Melksham, (2) Inhabitants of Westbury.

THURSDAY, MARCH 14.

Bill read the third time, passed, and sent to the Commons:—Bedlington Local Board Water.

A petition against the Trowbridge Water Bill was presented from Inhabitants, &c., of Bradford, Wilts.

FRIDAY, MARCH 15.

Bills brought from the Commons, read the first time, and referred to the Examiners:—Brading Harbour District Gas; Hartlepool Gas and Water.

Bill read the third time, passed, and sent to the Commons:—Sutton-in-Ashfield Gas.

### HOUSE OF COMMONS.

MONDAY, MARCH 11.

The Examiners reported that no Standing Orders not previously inquired into are applicable in the case of the Deal Water Bill (Lords.)

Bills, as amended, considered, and ordered for third reading:—Brading Harbour District Gas; Hartlepool Gas and Water.

Lords Bill read the first time, and referred to the Examiners:—Imperial Continental Gas Association.

The petition of the Great Northern Railway Company against the East Retford Borough Bill was withdrawn.

TUESDAY, MARCH 12.

Bill reported:—Southport Water. The Examiners reported that Standing Order 63 has been complied with in the case of the Lea Bridge District Gas Bill.

The petitions were withdrawn of (1) Oxenhope Local Board, (2) Great Northern Railway Company, against the Bradford Water and Improvement Bill; and of (1) Justices of the Peace for the County of Nottingham, (2) St. Ann's Mutual Benefit Building Society and others, against the Nottingham Improvement, Gas, and Water Bill.

The West Houghton Local Board Bill was referred to a Select Committee, consisting of Mr. Sandford (Chairman), Mr. Henry Chaplin, Colonel Carrington, and Mr. Dunbar; to meet on Tuesday, March 19.

The East Retford Borough, the Nottingham Water, the Nottingham Improvement, Gas, and Water, and the Radcliffe and Pilkington Gas Bills were referred to a Select Committee, consisting of Mr. Holmes (Chairman), Mr. Cartwright, Mr. Barne, Mr. Bowen, and Mr. Bonham-Carter (Referee); to meet on Tuesday, March 19.

The Bradford Water and Improvement, the Scarborough Water, and the Scarborough Corporation Water Bills were referred to a Select Committee consisting of Mr. C. W. Wynn (Chairman), Lord Charles Bruce, Major Peplow, and Mr. Mackintosh; to meet on Tuesday, March 19.

#### METROPOLIS WATER-WORKS (PURCHASE) BILL.

A petition against this Bill was presented from the Bartholomew Club, City of London; and one in favour of it from the Board of Health for Woolwich.

On the Order for the second reading of the Bill, Sir JAMES HOGG said: Sir, in rising to move the second reading of the Metropolis Water-Works Purchase Bill, I may commence by explaining that it deals with one of the most important questions which can affect the inhabitants of this Metropolis—namely, the question of an abundant supply of pure water. I ask the House to grant me a second reading of this Bill, for the purpose of referring it to a Select Committee, where it will be taken in connection with the Metropolis Water Supply Bill, which has already passed a second reading in this House, and which is a Bill for the better supply of pure water to the Metropolis at large. I trust that, before the Committee to which the Bill will be sent, the interests both of the Water Companies and of the Public will be taken care of. I have heard some of the advocates of the Water Companies say that the antiquity of those Companies is a reason why they should not be purchased by a municipal authority. With regard to that I will simply make one or two observations on the present occasion. In the report of the Royal Commission of 1866, paragraph 246, it is stated: "The duty of supplying the inhabitants of a district with water has from a very early period been regarded as a peculiarly municipal function, and the supersession of the Municipality by Joint Stock Companies is a comparatively modern invention." I may say that I think the conditions of a good water supply are four. One is a pure source of supply; the second is a constant supply; the third is that there should be a proper high pressure; and the fourth is that it should be regulated by a municipal authority. As regards a pure source of supply for the Metropolis, I think it has been sufficiently established by Royal Commissions, and also by Committees of this House, that the sources of supply are not of a proper or pure character—I mean with regard to the River Thames and the River Lea. I know that some will say that the water is pure and wholesome; but the Rivers Pollution Commissioners in their report say, with regard to the Thames, "The result seems to be that the Thames, polluted with the sewage of the inhabitants of the river basin, is open in kind, if not in degree, to the same objections as well water unfiltered, polluted by liquid from an adjoining cesspool;" and in the sixth report, page 429, they say, "We therefore recommend that the Thames should, as early as possible, be abandoned as a source of water for domestic use, and that the sanction of your Majesty's Government be in future withheld from all schemes involving expenditure of more capital for the supply of Thames water to London." That is the report of the Rivers Pollution Commission with regard to the Thames. Then, with regard to the River Lea, they say, "The waters of the River Lea, and its tributaries, are polluted by the town sewage, and also by the refuse of manufactories." And in the sixth report they also say, "In our opinion, therefore, the Thames should, as early as



possible, be abandoned as a source of water for domestic use." Those quotations, I think, sufficiently prove that the sources of supply are not of a pure and proper character. Now we go to the water after it has been subjected to filtration, and there are divers opinions on that point. Dr. Frankland, I find, has given, on many occasions, his opinion on the water supplied to the Metropolis by the various Water Companies. I know that some say the water is of a pure and proper character, and they would naturally refer to a book published by Dr. Tidy. If a man finds that the water in his own house is not in a proper condition, would he not take means to put it in a proper condition? What is applicable to individuals is applicable to communities at large, and I think we ought to pay some sort of attention to the reports which Dr. Frankland issues from month to month, and with the permission of the House I will refer to two or three. I know that at this time of night Members do not like quotations, but, in justice to myself, I must ask their patience for a short time; and I can assure the House that I would not have brought forward the question at so late an hour had it not been that, as a private Member, having no influence and no Government power, I should not have been able to bring the subject forward at all if I had not taken the only opportunity which offered. Well, then, with the permission of the House, I will read one or two extracts, for the purpose of showing whether the water which the Members of this House, and the rest of our fellow-subjects in London, have the good fortune or the ill fortune to use, is of a pure and proper character. Dr. Frankland says, "The water drawn from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was much more polluted by organic matter in September (1877) than in July and August. The water delivered by the Grand Junction Company was turbid, owing to inefficient filtration. The remaining Thames water was efficiently filtered, but that supplied by the Southwark Company was distinguished by containing a large proportion of organic matter, some of which was of animal origin. The water of the River Lea, supplied by the New River Company and the East London Company, was of much better quality, and was efficiently filtered before delivery." Then he says in October—and this is really a special thing, and one to which I would call the attention of the House—"The river water supplied to London during the past month was of unusually good quality; that abstracted from the Thames being fully equal to what is usually obtained from the Lea, whilst the water from the Lea, delivered by the New River and East London Companies, was of the average quality, equal, in mechanical purity, to the deep well water. Moreover, all the river water was efficiently filtered before delivery." And in December, 1877, he says, "The water drawn from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was much polluted by organic matter, some of which was of very objectionable origin; and although it was efficiently filtered by four out of the five Companies, it was quite unfit for dietetic purposes. The water delivered by the Grand Junction Company was slightly turbid, and contained moving organisms. The water from the Lea, as delivered after efficient filtration by the New River and East London Companies, was also polluted, but to a much less extent." I think I may now say that I have established the position that, in the Metropolis, the water, though filtered with due care by the Companies, contains matter which no man, unless he be a man of a very curious feeling, would be anxious to drink. And I must say I was not astonished to hear a noble lord, a distinguished Member of the House of Lords, say in another place that in 1857 the Home Secretary had brought in a Bill about water, and a friend of his was sick about that time, and he asked his doctor what he thought was best for him to drink, beer or water, and the doctor said, "Take my advice, drink beer." I see my honourable friend the Member for Carlisle (Sir W. Lawson) looking at me; but I trust that I shall have his assistance in getting this Bill referred to a Committee, in order that every person in London who wishes to have good water to drink shall be able to get it. I think I have established that point, and the next is constant supply. I will not take up too much of your time by dwelling at length on this point, because it has been established, both by Royal Commissions and by Committees of this House, that it is necessary that there should be a constant supply of pure water for domestic consumption to every house, and that it is also necessary, for the purpose of protection against fire in the Metropolis, that watershould be laid on at high pressure. I do not maintain that the Companies do not now give what is called high pressure; they vary as to the amount of pressure. They are not bound by Act of Parliament to give one pressure. I do not wish to say anything generally against the Companies on that point. I believe that the New River Company have been recently constructing reservoirs for the purpose of the water being taken at the highest point. I believe that this has been carried out to a certain extent by another Company also—the East London. But I believe they have not constant supply and high service, which, according to the report of the Fire Brigade Committees and of the Rivers Pollution Commission, cannot be carried out in any shape or form unless you have a thorough unity of management. In the great cities of Manchester, Liverpool, and Glasgow they have this unity of management, and I want to ask the House, if in those great centres of commerce and industry it was found that it was not convenient to have one single Company giving the water supply, but that the supply should be under the management of the Municipality, is that not ten times more applicable to London, where you have such a large population, and where you find not one single Company, but eight different Companies having separate managements? Is it not even still more necessary that the Metropolis should have one consistent management under one municipal head, by which the service could be carried on in a proper and efficient manner? I have heard it suggested, and, in fact, the Metropolis has been somewhat agitated by the proposal, that these Companies should be amalgamated; but I think it is apparent to every Member of this House that if the whole of the Companies could be united together in one, with one management, you would find that the immense number of Directors and Secretaries and other officers would swell the expenditure, and necessitate a great addition to the water-rates. I have just one or two quotations with regard to placing the water under the Municipal Authority, which, with the permission of the House, I will read. The Committee of 1867 recommended that the duty of seeing that the Water Companies fulfilled their duty should be imposed on the Metropolitan Board, and the conclusion of the Royal Commission was "that no trading company should be permitted to levy or expend a compulsory rate, and that the future control of the water supply should be entrusted to a responsible public body, with powers conferred on them for the extension of existing works and the levying of rates therefor." Before the same Commission a very eminent Engineer, Mr. Bateman, gave evidence that he was so convinced that the greatest advantages would result from the water supply being in the hands of a great Corporation for the benefit of the whole Metropolis, that he would not advocate any scheme which did not include that idea; and Mr. Duncan, at page 136, says his experience is most decidedly in favour of corporate bodies in large towns having the entire charge of the works for the supply of water; and Sir Joseph Heron, a great authority on such matters, says he thinks that the experience they have had in Manchester has shown them very clearly the very great advantage of having the water-works under the Municipal Authority. I will not weary the House by further extracts. If I wished to do so, I could; but I will now point out another motive for purchasing these water-works, We

all know how London extends year by year. As fresh houses are built, fresh apparatus has to be provided, and in order that they may be enabled to provide water for these new houses, the Water Companies are obliged periodically to raise fresh sums of money. Now, what do they expect to get for these sums of money? Do they expect, as we have seen has been stated by various deputations to Ministers, 5 or 6 per cent.? Why, they are groaning because they do not get 10 per cent. We have heard complaints of the expense of buying up the Water Companies; but I say, and I think the House will agree with me, that the longer this inevitable measure is postponed the more will the expense be increased, because it is impossible that the water supply should be always left in the hands of private Companies, and therefore the longer this important question is postponed, the greater will be the expense to the ratepayers of the Metropolis in the end. I do not want to say anything against the gentlemen who take care of the interests of the Water Companies, and who manage their affairs; but what I do say is this, that they look, and must look, and it is only fair that they should look, to the interests of their Shareholders; whereas the business of a public body, responsible as they would be to their constituents, would be to give the purest water they could, to give that water continuously at high pressure, to give plenty of it at the cheapest possible rate, and, if any benefit should arise from the extension of London, which does accrue, and must accrue, year by year, that should go into the pockets of the ratepayers in the Metropolis, and not into the pockets of the Shareholders in any private Company. I know that some have complained about the manner of purchase proposed in the Bill. The Bill contains provisions by which it is proposed to arrange with the Companies for the purchase of their works on fair and equitable terms, and if the Water Companies cannot see their way to agree to an arrangement, on fair and equitable terms, with the Metropolitan Board and Municipal Authority, why, the matter will go, as any other purchase goes, before an Arbitrator, who will take everything into consideration; and, after he has given his decision, then, with the 10 per cent. extra, the purchase will be completed. I do not wish to take up the time of the Members further than by saying that I trust they will give a second reading to this Bill, and allow it to go to a Select Committee; and, if the House consents to the second reading, I shall move that it be referred to the same Committee as that to which the Bill for a fresh supply of water for the Metropolis has been referred, and who will do justice to the Consumers, as, I am quite sure, they will do justice to the Water Companies of the Metropolis. I beg to move that the Bill be read a second time.

MR. SAMUDA: I move as an amendment that the Bill be read a second time this day six months. I have listened to the speech of the honourable baronet who has just sat down, and I cannot discover a single argument for the measure that he has proposed. There are two most important Bills with which we have to deal in this matter. The one that is before us at the present moment is called the Metropolis Water-Works Purchase Bill; but there is another Bill to which the honourable baronet has referred, and which he desires to couple with it, and if he can succeed in getting the House to read this Bill a second time, he proposes to take them together in Committee. This second Bill is called the Metropolis Water Supply Bill; and we have this most extraordinary proposal to deal with—that the Metropolitan Board of Works come down and ask us to allow them to absorb the Water Companies, who are performing the duties for which they have obtained the sanction of Parliament; and, at the same moment that he asks us to allow the Metropolitan Board of Works to absorb the Water Companies, he appears before us in the character of another Company seeking to compete with them, and to lay down fresh water-mains all over the Metropolis. I will deal with the second scheme presently; but I will first pass in review the scheme which we have before us at the present moment. By this scheme, as I have said, he asks us to allow the Metropolitan Board of Works to purchase the whole of the water-works of the Metropolis. Now, first let me point out what that involves. The Metropolitan Board of Works have at the present time jurisdiction over an area of 120 miles, and he asks us to sanction their becoming the proprietors of, and having a jurisdiction over, the whole of these water-works, which reach over an area of 520 miles; so that it is not only the water-works of the Companies that, on the part of the Metropolitan Board of Works, he asks power to acquire, but that that body should have jurisdiction outside the Metropolis over four times the extent of the area over which they now exercise jurisdiction. In addition to that there is another body—namely, the Corporation of London, which is within the area which he wants to absorb—and he asks that the City should get water from the works which would be under the management of the Metropolitan Board, instead of getting it through the New River Company. Now the honourable baronet has called the attention of the House to what he terms the state of the water, but I think I can satisfy the House that the quotations which he has made require a great deal of correction. And first I would observe that the Water Companies, as they exist at the present moment, are by no means what might be termed independent bodies, for under the Acts of 1852 and 1871, they have become amenable to Government control. They are under the control of the Local Government Board. There has been appointed under those Acts a Water Examiner, whose business it is continually to keep a record of the state of the water, and the quantity of water that is being supplied. There are also Auditors appointed, who have to take the greatest care that the accounts of the Companies are carefully made out and accurately furnished, and that their dividends are not in excess. By the Act of 1871, so much care has been taken of the public that it is enacted that, wherever it is required, a constant supply shall be given by these Companies, and that hydrants shall be supplied by them where they are required by the Local Authorities. I may mention that a great deal of obstruction has been thrown by the Metropolitan Board in the way of these hydrants being supplied. But passing that by, I may remark that, in addition to this, there are exceedingly heavy penalties, amounting to as much as £200 per week, to be imposed upon the Companies if they fail to comply with the duties and obligations they have incurred under the statutory obligations imposed upon them. They have been called upon, from time to time, materially to improve the sources from which they take the water for the Metropolis, and they have improved them to the extent that, instead of being, as the honourable baronet would represent to the House, liable to be blamed for their neglect, they should be praised. By the Act of 1852, all the Companies who drew their water from the Thames were required to improve their sources of supply by taking the water from points higher up the river. That has been done. In 1867 there was a public Committee, presided over by a late colleague of mine, Mr. Ayrton, a very painstaking man, and I think the present President of the Local Government Board was a member of that Committee, and, therefore, there were men on the Committee who were well able to thoroughly investigate the matter, and in whom this House would have confidence. This is one of the Committees from whose report the honourable baronet, who moved the second reading of this Bill, quoted extracts, in order to show that the water was not that which it should be; but the Committee say: "We are satisfied that both the quantity and the quality of the water supplied from the Thames are so far satisfactory that there is no ground for disturbing the arrangement made by the Metropolitan Water-Works Act of 1852, and any attempt, to do so will only end in a waste



of capital, and unnecessary charges on the owners and occupiers of property in the Metropolis." That, I should submit, is a proper answer to the honourable baronet. But in 1869 there was a Royal Commission, presided over by the Duke of Richmond, and they say in their report that, "After examining the schemes for the supply of water in the Metropolis, there is no evidence to lead us to believe that the water now supplied is not generally good and wholesome." Then, in 1871, there was another parliamentary inquiry, which resulted in the passing of the Act by which an Examiner and Auditors were to be appointed. Well now, by virtue of these Acts, not only have the Government authority over the Companies, but the Medical Officers of Health have to report from time to time, and I have in my hand a report of Dr. Tidy's for a period of ten years. After referring to previous analyses, which justified the report of the Commissioners, he says: "Let me, however, submit that the question is simply this, Is the present water supply to London pure and wholesome?" Now, that is the very thing we have to consider. Here we have an outside authority coming in and speaking on this point. After making some other observations, he says, "And here I venture to state very broadly, that the analyses justify me in the assertion that the water supplied to London, the healthiest City in the world, is as excellent in quality as it is liberal in quantity." Now, I do not think, after such a statement as this, that the Water Companies can be fairly charged with not having fulfilled the duties imposed upon them. Let me say a word with regard to the Companies themselves, and then I will deal with the other questions. The Companies are in this position: Many of them have been formed for 100 years and upwards, and the returns during the early periods of their existence were of the most miserable description. To give one single instance which I know better than the rest—that of the Kent Water-Works Company, who have been established about 70 years. In the first 40 of these 70 years, the dividend averaged only a trifle more than one per cent.—it did not amount to one and a quarter. It has since risen, and I think it is now 8 per cent. That is a representative case, and if you take all the Companies through, I believe that their average earnings at the present moment are less than 8 per cent., though, by the Acts of Parliament, they may divide as much as 10 per cent. But the honourable baronet comes down and wants to purchase these Companies when they have turned the corner, and, after great difficulties, have arrived at an ordinary amount of earnings. Then the honourable baronet deals with the question of economy, and asks the House to believe that the transference of these Companies to his Board would result in economy to the Consumers. Nothing of the sort. I think I can satisfy the House that it would result in exactly the opposite. In the first place, I would point out that the income of the whole of the Companies is £1,200,000 a year—I mean in round numbers. Of that, £750,000 goes for dividends, and £450,000 for expenses. Well now, to purchase these Companies—to purchase them fairly and properly, even the honourable baronet will not deny, will take at least 25 millions. It cannot be otherwise; 12 millions of money has been spent by these Companies, and the market value of that 12 millions represents the sum I am speaking of—25 millions. The plan of the honourable baronet is an extremely ingenious one. He proposes first to compete with them, and reduce their dividends, and then buy them up. But I am quite sure he will not get Parliament to sanction that. But this is not all. According to his own account, he must spend 5 millions more on the works to be constructed, in order to enable him to compete with the Companies. Four per cent. on 30 millions—and I do not think he is likely to get the money for less—will require £1,200,000 a year for the interest, which will absorb all the present income, at once, and there is nothing for the expenses, so that the Metropolis would have to pay the whole of the working expenses in addition to those of the new works scheme. At the present moment the expenses of the Companies amount to nearly half a million of money a year, and, if he is going to lay down an entire set of pipes, he cannot do it for the present expense, but will have to add half as much more, so that the annual outlay will be three-quarters of a million. And when I tell you—and I am sure the House is prepared to expect it—that the works which he proposes to carry out, instead of costing 5 millions, will cost not less than 10 millions—it will turn out that the Metropolis will be mulcted of twice the amount that at the present moment it pays to the Water Companies of whom he knows nothing. He attempts to justify his proposal by pointing to what has taken place in handing over the provincial Water Companies to provincial Municipalities. But this is a case so totally different that you cannot compare the two things. Take a very large provincial municipality—take Manchester, for instance. Why, that represents in the whole about one of these eight Companies; and, therefore, you cannot compare these establishments with those of provincial towns; and when an establishment has grown to the size that some of these Companies have, it must be fully maintained, and any interference with it, instead of doing good, will do harm. But I cannot leave this subject without referring to what is of considerably more importance, and that is their new works scheme. Now, a more crude, undigested, and impracticable scheme has never been put before the public. I will endeavour to explain what this scheme is. It is a proposal that the Metropolitan Board of Works should be empowered to go into every water-works district, to invade those districts, and to rob them of their customers. Under the guise of philanthropy to the public, they are asked to throw themselves into the hands of the honourable baronet and his Board, that they may deal with them in any way they may think fit. Now, the Kent water-works differ from the other water-works, in that they draw the whole of their supply from chalk wells. They have a large district, and they have several pumping-stations. They have a district for which they require 11 millions of gallons a day, and if the population of their district goes on increasing at the same rate that it has done—and it is probable it will be not less, but greater—in ten years or so they will require not 11, but 16 millions of gallons a day. Now, the proposal of the honourable baronet is to draw from these wells 16 millions of gallons a day for the supply of the Metropolis. I will show how absurd that proposal is. They propose to get six millions on one side and ten on the other, at Grays, because the wells there are known to be in conjunction with those on this side. But dealing with the case only on the question of the 10 millions, the Kent Water Company will shortly require 16 millions. The whole of their collecting wells only yield, at the present moment, 20 millions, and therefore it follows that, if you take the water at all, you must rob the Kent Water Company. But that is not the only difficulty that you have. When the honourable baronet has obtained this quantity of water, he proposes to supply the houses of the Metropolis with a double quantity of water. One of the supplies is to provide against the danger from fire and the like purposes, and the other is for anything else. I should like to know who has the management of his house in that state of control that he could restrict his servants as to which tap they should take the water from. As they are requiring and using at the present moment 35 millions of gallons a day, and as 16 millions of gallons would only be four gallons a day for everybody, it follows that, instead of 16 millions, he would require 36 millions a day, or, at any rate, an enormous deal more than he has provided; and, as I have shown, he has not the means of getting even the modest amount that he speaks of getting, it follows that his scheme is impracticable and unworkable; and as this scheme is the only scheme on which the pro-

posal for purchase rests, it follows that if the one thing falls the other must fall with it. But I would urge that there are reasons altogether apart why we should not pass this Bill. It does not appear to me that the Metropolitan Board of Works are the right body to be entrusted with this authority. Part of my argument is that these water-works should not be purchased by any Local Authority, but apart from that I say that the Metropolitan Board of Works were established for a totally different purpose, and that no justification for the course that is proposed has been shown. I recollect that in just the same way it was said it might be necessary to raise another 35 millions to buy up the Gas Companies. On that occasion—I hope I may have now the assistance of the Chancellor of the Exchequer as I had then—on that occasion the Metropolitan Board opposed a Bill to get some additional capital for a large Gas Company at the East-end, and spoke of it as if it was almost their property. Well, I appealed to my right honourable friend opposite, and the answer I got from him was practically this: I said he should not sanction this without due consideration, and the right honourable gentleman told me that the Government had in no way and in no sense committed themselves to the Metropolitan Board as to taking the Gas Companies over. I maintain that they have no justification for making this proposal either, seeing that they were appointed for a different purpose. Lastly, I would urge upon the House that if it should ever become necessary, from the increase of London, to seek for an additional supply of water, that the plan proposed is futile and that we shall have to bring the water from one of the Lake districts. Under such circumstances I can imagine that the House would entrust that undertaking to some large central Municipal Authority, which may by that time be created; but giving the authority asked for to the Metropolitan Board now would only increase the difficulty of dealing with the question satisfactorily then. For all these reasons I hope that the House will reject this Bill. I do not want to go further. I wish to avoid wearying the House; but my anxious desire is that the House should reject this Bill on the second reading, because, as I have endeavoured to show, and I hope I have shown, the Metropolitan Board of Works are not the right body to have this matter entrusted to them, and they have made out no case on which they can show that a public benefit would result.

Alderman COTTON said, at that late hour, and after the exhaustive speech of the honourable gentleman who had just addressed them, all he would say was that he quite agreed with him that the Metropolitan Board of Works were not the right body to have the control of the water supply of the Metropolis. They were a very ambitious Board, endeavouring to assume to themselves all kinds of functions; but instead of sinking wells in the chalk formation all round London, he would recommend them to confine themselves to the purposes for which they were appointed.

Mr. GOLDNEY moved that the debate be adjourned.

Mr. CHARLEY said he thought the House would see that this was a Bill of great public importance, and that it was too late to discuss it at that time of night. He supported the motion for adjournment.

Mr. GOSCHEN said, if the debate were adjourned, he hoped the Bill would not be brought on again, unless there was ample time for the discussion. The speech of the honourable Member for the Tower Hamlets showed that this was not the kind of measure to be brought on between twelve and one o'clock in the morning.

Sir JAMES HOGG said, he thought, in justification to himself, he should ask the House to recollect that he was only a private Member, and had the greatest difficulty in bringing on the Bill, and was obliged, therefore, to take any opportunity that offered. He trusted that, if the debate were adjourned, the Government would give him an opportunity of bringing it on again at a time when it could be fully discussed.

Mr. FAWCETT said he thought that his right honourable friend, the Member for the City of London, was somewhat hard in his observations. He blamed the Chairman of the Metropolitan Board of Works for bringing on the Bill at so late an hour. The right honourable gentleman had great experience of the forms of that House, and he would ask him to give the Chairman of the Metropolitan Board the benefit of his experience, and suggest to him how he could have had a more favourable opportunity, unless he got the assistance of the Government. He (Mr. Fawcett) had not formed a strong opinion at all on this Bill; in fact, he had not told his constituents, and not one of them knew in the least degree how he should vote, and he might add that he had not the slightest interest in any Water Company. But the real question just now was this: This matter was left entirely in the hands of a private Member, because, although the Chairman of the Board of Works was the representative of a great corporation, who were responsible for the government of the Metropolis—(cries of "No" and "Yes")—yes, as far as Water Bills were concerned, were responsible for the government of the Metropolis—(cries of "No")—then what other municipal body was? It was perfectly well known that all great works in the Metropolis were committed to the Metropolitan Board of Works. He thought that that body might be much amended in its constitution; but, practically, all great public works in London had been carried on by them during the last ten years, and if the Chairman of that Board, or some other body, did not take up questions of this kind, what would be the position in which the Metropolis would be placed with regard to its future supply of water? They all knew the cogent resistance that was offered to every Water Bill, or anything attempted to be done in the interest of the ratepayers in the Metropolis. They all knew perfectly well that the Chairman of the Metropolitan Board had not one whit more influence or power to bring his Bill on than the most insignificant Member of the House. They all knew perfectly well the kind of resistance offered to Bills by private interests that considered themselves affected; and he trusted, therefore, that if the debate were adjourned, it would not be without some understanding with the Government that the Chairman of the Metropolitan Board should be afforded facilities for bringing on the Bill again. Every Wednesday to the end of the session was fully taken up, and there was no chance whatever of its being brought on on a Wednesday, and very little chance on a Tuesday. Monday, Thursday, and Friday were Government nights, and, therefore, this measure could not be brought on on any of those nights. He admitted that a measure of this importance could not be discussed at one o'clock in the morning; and yet it ought to be discussed. It was a matter of vital importance, affecting the health of the Metropolis; and if the debate were adjourned that evening without the Government giving an undertaking to the Chairman of the Metropolitan Board that they would assist him to bring on this important Bill on some other occasion, the people of the Metropolis would be virtually told that this subject had been shelved for this session. Exactly the same fate would await every Bill of the kind that might be brought in for the next ten years, and, therefore, there would be no chance of this important question affecting their health, and, consequently, their happiness, being considered—the question, whether the water supply should be left in the hands of the present Companies, or whether it should be entrusted to some representative body of the ratepayers of London. Of course it was impossible that they could decide on the merits of this Bill after such a discussion as they had had, and he had no doubt that the debate would be adjourned; but he strongly urged the Government, and he thought he had a right to press it, as representing one of the most populous Metro-



politan constituencies, to give some undertaking to the Chairman of the Metropolitan Board of Works that this great and important subject should not be shelved; but that they would render him some assistance in bringing it on again, so that a matter so important to the population of the Metropolis should receive due consideration.

Mr. SHAW LEEFVRE said, as his right honourable friend, the Member for the City of London, could not speak again, he wished on his behalf to assure the Chairman of the Metropolitan Board that he was quite aware of the difficulty, and, indeed, the almost impossibility of bringing on a measure of this kind without the assistance of Government, and his right honourable friend wished to say that he hoped the honourable gentleman would have the assistance of Government in bringing it on again at a time when it could be thoroughly discussed. For his own part, he was distinctly favourable to this measure. He believed it would be for the interest of the public that the water-works should be put under one representative body. Whether that body should be the Metropolitan Board of Works was another matter. He thought that was a question that might fairly be discussed in Committee; but the principle of the Bill, that the water supply should be in the hands of a public representative body, he thought should be affirmed. These were his views, and he should like to state them at greater length when the Bill came on again; but he would now press on the Government the importance of naming some not very distant day for the discussion of this measure, and that they should give to the House some indication of what their own opinion was. Looking at the importance of the question, he thought that the Chairman of the Metropolitan Board was entitled to ask the Government to give him a day on which he could bring on the Bill again, as, without that assistance, he would be totally unable to do so.

The CHANCELLOR of the EXCHEQUER: I have heard it sometimes said that the public have an idea that the Consolidated Fund may be drawn upon to any extent, and that its resources are illimitable, and something of the same idea seems to prevail in this House with regard to the amount of time that the Government have at their disposal. Now I must protest, on behalf of the Government, that the amount of time placed at our disposal by the rules of the House is by no means too much; indeed, it is not nearly enough for the work we have to get through. Looking at the necessity of getting on with Supply and with the Bills we have thought it right to introduce, we have not that superabundance of days that we can afford to place any at the disposal of private Members. With regard to this Bill, we are told, and told truly, that it is one of a large and important character, and one that deserves full consideration, and that the Government ought to give an opportunity for discussing it. If the Government were of opinion that it was a measure they ought to bring in on their own responsibility, undoubtedly they ought to provide for it. We do not feel that we are in that position, and we are not able to undertake the responsibility. Of course, if the Bill comes on, we shall be prepared to express an opinion in regard to it; but, as matters now stand, I cannot at all undertake that we shall be able to find a day for the thorough discussion of the measure.

Alderman Sir A. Lusk said the supply of water to the Metropolis was a most important matter, and well deserving the attention of the House; but his respected friend, the Member for the Tower Hamlets, seemed to treat the inhabitants of London as if they were sheep and cattle, and to assume that they had no right to get water but from the Water Companies. Now, he objected to that, and he thought that the Metropolitan Board of Works had taken a wise course in bringing forward this Bill at the present time. A day might come before long when there would be a severe drought, and the present sources of supply would fail them, and he thought, therefore, that they ought now to look out for fresh means of supply. The longer it was delayed the worse it would be, and it was the duty of Parliament to consider the serious position they were in. He protested against the doctrine that they were not to get water except from the Companies, and he would support the Chairman of the Metropolitan Board, because he asked them to consider this question in a business-like manner.

The motion that the debate be adjourned was then agreed to.

#### WEDNESDAY, MARCH 13.

The petitions were withdrawn of (1) Birstal Local Board, (2) Hunsworth Local Board, (3) Calverley District Water-Works Company, Limited, against the Bradford Water and Improvement Bill; and the *locus standi* of (1) Heaton Local Board, (2) Eccleshill Local Board, (3) North Bierley Local Board, as petitioners against the Bill, was disallowed.

#### LOCAL GOVERNMENT AND TAXATION IN LONDON.

Sir UGHTRED KAY-SHUTTLEWORTH gave notice that on going into Committee of Supply on Friday, April 5, he would call the attention of the House to the state of local government and taxation in London, and to the need of a measure extending to the Metropolis the benefits conferred on other cities and towns by the Municipal Corporations Act, 1835; and move—  
"1. That, in the opinion of this House, the present state of local government in London is unsatisfactory, and calls for reform. 2. That the whole Metropolis should be united under one administrative authority, directly representing the ratepayers, and so constituted as to command general confidence. 3. That these conditions are not fulfilled under the present system of administration, partly by Vestries and District Boards, partly by the Metropolitan Board of Works, partly by Companies trading in Water and Gas, while the functions of the Corporation are confined within the narrow limits of the City. 4. That the ancient Corporation of the City, if extended over the Metropolis, and remodelled in accordance with present wants, would best achieve the purposes of a Municipality for London. 5. That this reform should be undertaken by Her Majesty's Government without delay."

#### THURSDAY, MARCH 14.

Bills read the third time and passed:—Brading Harbour District Gas; Hartlepool Gas and Water.

The Examiners reported that Standing Order 62 has been complied with in the case of the Radcliffe and Pilkington Gas Bill.

Lords Bill read the first time, and referred to the Examiners:—Dublin Corporation Water-Works Acts Amendment.

The petition was withdrawn of Mary, Countess Ossalinsky, against the Manchester Corporation Water Bill.

#### FRIDAY, MARCH 15.

Bills reported:—Farnworth and Kearsley Gas; Torquay Gas.

The Examiners reported that no Standing Orders not previously inquired into are applicable to the Imperial Continental Gas Association Bill (Lords).

Bills, as amended, considered, and ordered for third reading:—Bangor Local Board; Sevenoaks Water.

Petitions in favour of the Nottingham Water Bill were presented from (1) Owners, &c., of Greasley, C. E. V. Roberts and others, (2) Owners, &c., of Greasley, Thomas Bayley and others, (3) Owners, &c., of Eastwood.

The petitions were withdrawn of Manchester, Sheffield, and Lincolnshire Railway Company against the East Retford Borough Bill; and of (1) London and North-Western and Lancashire and Yorkshire Railway Company, and (2) Lancashire and Yorkshire Railway Company, against the Manchester Corporation Water Bill.

#### SATURDAY, MARCH 16.

The petitions were withdrawn of Sir Harcourt Johnstone, Bart., M.P., against the Scarborough Corporation Water and the Scarborough Water Bills; and of the North-Eastern Railway Company against the latter Bill.

### Legal Intelligence.

#### HIGH COURT OF JUSTICE—CHANCERY DIVISION.

SATURDAY, MARCH 9.

(Before Vice-Chancellor BACON.)

In re THE HOUGHTON-LE-SPRING GAS COMPANY.

Sir HENRY JACKSON, Q.C. (with him Mr. Woods), said this was a petition presented by a Shareholder for the compulsory winding-up of the Company. The Company being unlimited, the petition was presented under section 199 of the Act. The Company was formed in the year 1834, for the purpose of lighting the streets, houses, and other places in the village of Houghton-le-Spring and elsewhere, by a deed in the form of a deed of settlement, dated May 22, 1834. By this deed the capital fund required for the establishment of the works amounted to £1200, which was to be raised by shares of £10 each. No power was given by the deed to borrow money. The Directors were also required to invest a reserve-fund of £300; but whether this had been done or not was not known to the petitioner.

The VICE-CHANCELLOR said the Company must earn the money before it could be invested.

Sir H. JACKSON: No doubt. The Company had carried on business since 1834, and the whole of the capital was subscribed for, allotted, and fully paid up. The petitioner, Mr. George Tweddell, was the registered proprietor of four shares. Although, according to the deed, two meetings were to be held every year, no general meeting had been held for the last four years, nor had any statement of accounts been prepared and issued to the members. Since the Company's formation only six divisions of profits had taken place, the last of such divisions being many years ago. On the 2nd of January last the petitioner gave notice to the Company that he wished to inspect the books, and was informed by the Secretary that he could not do so. About March 21, 1877, notices were sent to the members convening a meeting of the Company for the 11th of April, in order to alter the deed by which the Company were constituted, in certain particulars, so as to give power to the Directors to borrow sums of money to pay their indebtedness. Accordingly, on the 11th of April, such meeting was held, at which four Shareholders attended, and affected to pass a resolution giving the Directors the requisite power, but such resolution the petitioner submitted was null and void, on the ground that the requisite number of Shareholders were not present. The Directors, in pursuance of the resolution so passed, had borrowed large sums of money, amounting to £4224, and mortgaged, or were about to mortgage, the property of the Company to secure the same. The outstanding liabilities of the Company, in respect of trade bills and similar engagements, amounted to £2297. Among other liabilities incurred in the name and on the credit of the Company was a debt of £256 17s. 2d. due to a Mr. Potter, who had threatened to take immediate proceedings against the petitioner for the recovery of the same. Then the petition charged that the Company were wholly insolvent, and unable to meet their engagements and pay their debts, that they had no available assets for that purpose except by means of calls upon the individual members of the Company, in addition to the capital fully paid up; and, therefore, it was just and equitable that the Company should be wound up. There had been a valuation made by the Contractor who erected the works, and his affidavit had been filed. In it, he stated that the works which he had erected, and in respect of which a large sum was still due and owing, were worth a great deal more than the debts of the Company. But the debts of the Company were in black and white, and spoke for themselves. He should show that the concern had been taken possession of by a clique consisting of three or four persons who had been working it entirely as their own property, and who neither called meetings, nor allowed the books to be inspected by other Shareholders. These persons had themselves proposed a winding up, in order to convert the Company into a Limited Liability Company, and the meeting for that purpose stood adjourned until after this petition had been disposed of. He hoped that his lordship would see fit to make an order for a compulsory winding up on the petition, and so render the further prosecution of the proposal mentioned unnecessary. It was evident the Directors considered it expedient that the Company should be wound up, but they wished to wind it up in their own way instead of having it done under the protection of the law. The Secretary of the Company had filed an affidavit denying that the Company were in difficulties, and had set out the balance-sheets for the years 1876 and 1877. By the first it appeared that the debts were £4124, and the assets £583. The value of the works was put down as £9081, but there was nothing in hand to meet the pressing liabilities to tradesmen, amounting to the sum of £1501. The second balance-sheet showed that the liabilities were £7000 odd, the liabilities to tradesmen having increased from £1500 to £2955, while the assets to meet them were £1018, against £583 in the previous account. To get over this deficiency, the value of the works had been raised from £6081 to £9361, by which means they showed a surplus of something like £3. The affidavit then went on to state that the Company were not in an insolvent state, that what had been done had been done with the sanction of the petitioner, and that the debt to Mr. Potter had been paid. The Secretary had been summoned for cross-examination, and if he were in Court he wished to ask him a few questions.

Mr. SWANSTON, Q.C., who appeared for the Company, stated that the Secretary was present, and ready to be examined.

Mr. James Meiklejohn, cross-examined by Sir H. JACKSON: I have been Secretary of the Company since July 1, 1875. I had no connection with the Company before that date. I am a salaried Secretary. I am pretty well acquainted with the position of the Company. The debt which Mr. Potter gave notice to the petitioner to pay has been paid by the Company; it was paid on the 5th of February by a cheque. We had an account with the Earl of Durham of £388 due on the 1st of January; we applied to the Earl for his account through our solicitor, who is also his solicitor. The Earl's Agent gave a cheque to our solicitor for the £388, leaving a balance due on the account of £88. Our solicitor paid Mr. Potter's account out of that sum. Lord Durham owed us that sum for gas supplied; we supply his coalpits with gas. Our solicitor paid the debt due to Mr. Potter; it did not pass through our hands at all, though it was paid out of the Company's money. In the balance-sheet to Jan. 1, 1878, the £388 is included in the item, "Gas-rents due." The debt to Mr. Potter was due for cement used in building a new gasholder tank. It is really a capital expenditure. None of the other tradesmen are pressing us in respect of their debts. Since the 1st of January we have not paid £1000, or anything like it, in respect of the debts then due. I do not think £200 has been paid, over and above the sum paid to Mr. Potter. You may take it that there is £2500 still due and owing. The £1700 to Miss Carr has not been paid; that sum is secured by a mortgage. The bond for £1000 to



Mr. Healey is still owing, as is also the sum of £750 to Mr. Broughton, and £672 to Mr. Edger. We have still £4125 due on those accounts, and £2500, or thereabouts, due to tradesmen.

Sir H. JACKSON: Are those tradesmen's debts unsecured?—I do not know what you mean by "unsecured."

Do you really mean to tell me you do not know what I mean by whether a debt is secured or not?

Mr. SWANSTON: They are not troubled with debts in the colliery district.

Sir H. JACKSON: Do not you know what it means?—I do not understand you—they are just ordinary tradesmen's accounts. We owe one firm between £1200 and £1300. We have given a bill for the amount, which will fall due in six months. To pay all these debts we have the value of the plant and the profits derived from the working. We were endeavouring to raise money on the works to pay off these debts, when the petition put an end to the negotiations. If we cannot raise this money the Company are in a very awkward position; but we have the promise of £5000 if we get the deeds of the Association altered. We should want £1700 besides the £5000 to pay all the debts with; but we have not been asked for the money on mortgage. We propose to get the Company turned into a limited one, and to apply to the Board of Trade for power in order to give security to the lender of the £5000.

Re-examined by Mr. SWANSTON: The gross revenue of the Company is about £2000 a year, and it is increasing rapidly. The population of the town we supply is between 7000 and 8000. We supply gas to all Lord Durham's pits in the neighbourhood of our works. The trade creditors of the Company have been applied to with reference to their debts, and they have written letters saying they will not press for immediate payment, having every confidence in the ability of the Company to pay. Before the petitioner took his shares, he went over and carefully examined the works, and I told him the state of the concern as it existed.

Sir H. JACKSON then summed up the case on behalf of the petitioner. He submitted that the Company were in a state of insolvency, that they were being sued by creditors, and had no assets to meet the claims. As they proposed to turn themselves into a limited Company, the winding-up order would do them no harm, because to do so the Company must be dissolved. There being debts to the amount of £7000, and no visible assets, he submitted he was entitled to a compulsory order to wind up.

The VICE-CHANCELLOR (without calling upon the counsel for the Company) said the case was too plain to admit of doubt. There was only one allegation in the petition which enabled it to hold water for a moment—that "the Company is wholly insolvent, and unable to meet its engagements and pay its debts, and has no available assets for that purpose, except by means of calls upon the individual members of the Company, in addition to the capital fully paid up as aforesaid." The case was one of the most ordinary partnership, and the winding-up Acts had no application to an ordinary partnership; they did not even, upon the proper construction of the words "just and equitable," apply to disputes between partners relating to the management of the Company. The only case in which the Court interfered was where the allegations to which he had just referred were established. Here they were contradicted and displaced in the most clear and explicit manner. The Company were not insolvent; they had been existing since the year 1834; they had paid, and were able to pay, their way; they had an income of £2000 a year, and had earned a profit for several years; they had property estimated at £9000, which was mortgaged for £5000, and there were debts to the amount of £2000, making altogether £7000. It could not be said that a Company owing £7000 were insolvent when they had realized property worth £9000. In his opinion, the petition was wholly groundless. There was no single fact upon which the petitioner could be justified in presenting his petition, or upon which an order could be made. Therefore the petition would be dismissed with costs.

SUSSEX SPRING ASSIZES.—FRIDAY, MARCH 8.  
(Before Justice MANISTY and a Special Jury.)  
GAS EXPLOSION AT BRIGHTON.

POCOCK v. THE CORPORATION OF BRIGHTON.

This was an action to recover damages arising out of an explosion of gas in the King's Road, Brighton, in the month of March, 1877. The charge against the defendants was that they improperly, negligently, and unskillfully used a steam-roller, thereby causing the damage by breaking a gas-pipe. The defendants pleaded that the gas-pipe was not broken by the steam-roller, and that the steam-roller was neither negligently nor unskillfully used.

Serjeant PARRY, Mr. COHEN, Q.C., Mr. Inderwick, Q.C., and Mr. Woodhill appeared for the plaintiff; and Sir Henry James, Q.C. (specially retained), Mr. Day, Q.C., and Mr. Finlay for the defendants.

Serjeant PARRY, in opening the case, said the plaintiff was a draper carrying on an extensive business in the King's Road, his house being situated at the corner of Market Street. The Corporation of Brighton were the defendants, and the action was brought to recover the sum of between £2000 and £3000; the allegation against the defendants being that in the use of what was called a steam-roller—one of those huge machines with which the public were acquainted—and in the careless and unskillful use of that instrument by their servants, they did cause the breakage of pipes that caused the explosion, and subsequently caused the accident and the damage done to Mr. Pocock's property. He would say at once that the interests of Mr. Pocock were not the only ones involved; there were several other persons living about Market Street, some eight or nine persons, he believed, whose property had been injured, and who also sought to recover damages against the Corporation of Brighton; and this action was, in one sense, what might be called a test action. There was no doubt that the defendants could, if they so chose, have the action tried over again; but he believed he was right in conjecturing that the defendants would never take that course, as should they in this action or by the decision upon this action find their liability for the accident decided, they would in all probability yield in the other actions pending against them. He would explain to them how the action was brought by Mr. Pocock. Mr. Pocock (the plaintiff in the case) was the owner of property which was insured in three London Insurance Companies, and they had paid him the sum of £1300. He claimed, besides that, a further sum of £900 or £1000, for which he was not covered by the policy; and, therefore, he had an interest over and above that of the insurance in this action. On this accident being discovered, and brought to the notice of the gentlemen, Messrs. Dawe and Sons, the Solicitors of the Insurance Company in London, they felt it to be their duty, as much as possible, to narrow the question, and to take upon themselves the responsibility of bringing the action on behalf of the persons who were injured. The jury would see that this was a fair and proper course, because, as he had said, there was not only this one interest involved, but the interests of several persons whose property and business had been damaged. They would perceive, too, at once, that most of those persons whose businesses had been injured by the accident were unable to bring actions against a wealthy body like the Corporation of Brighton. For example, one of the persons whose business had been injured was a poor lodging-house keeper named Knight,

who was, among some of the other persons there, uninsured; and this action had therefore been brought as an honourable and honest litigation, to ascertain who were to blame, and to fix the responsibility upon them. Having briefly explained the circumstances of the case, as afterwards disclosed in evidence, the learned counsel submitted for the consideration of the Jury that the accident had happened in consequence of the negligence of the servants of the Corporation in the use of their steam-roller, which they had had over the ground. The Corporation were the proprietors of this engine, and were, therefore, responsible for its action under the Act of Parliament which controlled them. The use of road rollers was regulated by the Locomotives Act of 1865, under which a Corporation possessed no privileges not enjoyed by a private person; and the question was, whether the defendants had exercised not moderate but substantial caution in the use of their machine, the weight of which was 17 tons. By the third section of the Locomotives Act, no steam locomotive of greater weight than 14 tons could pass over a road without permission of the owners of the soil; but the Corporation being the owners of the soil in this instance there would be no necessity for them to obtain such consent. If, however, a private person had made the application, he would probably have been communicated with the Gas Company, and made inquiries respecting the position of their pipes; and the same responsibility rested upon the Corporation, who should have ascertained facts for themselves.

Mr. Henry Paine said he was the proprietor of the Marine Hotel, Market Street. He remembered the 14th of March, 1877, the day on which the explosion occurred. Early in the morning of that day he saw the steam-roller going up and down Market Street, and he saw the water bubbling up through the roadway opposite his doorway. The roller went down as far as the King's Road, crossing at the bottom of the street, and then went back again. His door was about 50 feet northward of the crossing. It was as near seven o'clock as possible when he first noticed the water coming up through the road; and he believed the servants of the Corporation sent to have the water turned off. The roller continued to work for some time after that. The soil of the road was very bad just there, and had not been good since the drainage had been done. The roller stopped several times during the morning, and it was continually worked up and down the street after the water was turned off.

In cross-examination, witness said he could not say how often the roller had gone up and down Market Street during the last year or two. The soil was very bad opposite to his door, and water-pipes had broken there three or four years previously without the roller going over them. It was the sinking of the ground that broke the pipes then; the drains and pipes were very troublesome about there since the drainage had been put down. Once he saw a great hole where the foot of a horse sank in. There was no concrete upon which the pipes were laid, and they broke, he believed, by the mere sinking of the soil. In one place he saw only 3 or 4 inches thickness in the crown of the road, the substratum having subsided, leaving a vacuum which extended below the pipes that were exposed. He could not say what caused the breakage of the water-pipes when nothing had passed over them, and supposed they must have burst in an ordinary way.

In re-examination, witness asserted that he was positive he saw the steam-roller in the street on the morning of the accident.

Mr. T. Fellingham said he was a hair-dresser residing in Market Street, nearly opposite to Mr. Paine. On the 14th of March he remembered the steam-roller coming into the street between six and seven in the morning, and it remained until eight. The men in charge of it worked it up and down the street, reversing it on the crossway; but he could not say how far it went up. He saw the water in the road from the breaking of the pipe, but he could not say how long after the roller had been on the road that this occurred. He remembered three years ago the steam-roller trying to get up Market Street from the King's Road. He was standing at the bottom of the street; it was a frosty morning, and immediately the roller went away the ground rose and the water came up. This was on the crossway immediately opposite Mr. Barnard's. They threw sand over the ground to keep the water from freezing, and thereby caused the horses to fall down. They opened the ground on that occasion to repair the pipes. The oozing out of the water was from the spot which had been traversed by the roller. He saw the engine on the 14th of March standing waiting on the crossing about five minutes while the men were doing something to the tender.

Mr. W. Southon said he was a gas-fitter at 18, Little East Street, running out of Market Street. On the morning of the explosion, he noticed the water flowing down the channel in front of his house, and traced it to the place whence it was oozing out. He felt a thud, as if a building had fallen down, and he rushed out and saw what had happened. He obtained a crowbar and pick, and opened the road opposite to Mrs. Knight's house, between Mr. Barnard's and Mr. Pocock's, and a little north of the crossing. After that the road was taken up at the crossing by the Gas Company's men. He set a light to the gas, to draw it from the houses. The road was full of gas when the crossing was taken up by the men, and after the pipe was taken up he saw it. It was a perfectly clean fracture, the edges being quite bright, showing it was a recent fracture. There was concrete almost down to the pipe and granite pitchers when they took up the pipe. The depths of these blocks was about 6 inches, but he could not say they were all alike.

Cross-examined: The road was extended and widened out some years ago, but he could not say how long ago it was. After the ground was opened, he measured the distance between the top of the crossing of the road and the pipe, and it was 13 inches. He had not seen the steam-roller on the spot since. He had not seen the roller there before the day of the accident. When the road was opened after the explosion, he measured the depth from the surface to the top of the gas-pipe. It measured exactly 13 inches, measured by a straight-edge. The ground under the pipe was very wet. He could not say if there had been any subsidence of the earth near the point of fracture.

Two witnesses were called to prove that a smell of gas was perceptible, in houses adjoining the part of the road in question, on the morning of the accident.

His Lordship said he thought the inquiry might be shortened by dispensing with further evidence as to the actual fact of the explosion. There could be no doubt that the gas escaped from a broken pipe, and the real question was whether the pipe was broken by the steam-roller, and whether there was negligence on the part of the servants of the Corporation.

Mr. J. O. N. Butler, examined by Serjeant PARRY, said he was the General Superintendent of the Black Rock Works of the Brighton Gas Company. He resided at the works, and had been 43 years in the service of the Company. He first heard of the explosion about ten o'clock, and he ordered his officials down to the scene of it. He did not go down himself. He had seen the pipe and the fracture, and it was a clean one, and appeared to be recent. The pipe was laid originally in 1818, and was in the best possible condition. It was best cold-blast iron, hot cast not being known at that time. It was half an inch thick, and the diameter internally was six inches. The water-pipes were laid many years after the gas-pipes. He knew the crossing under which the pipe was laid. The Act of Parliament at the time did not prescribe the depth at which mains should be laid, and he could only judge inferentially how deep it was when first laid. The pipe had not been moved from its original position, but the foot pave-



ment had been removed. The crossing had been in its present position 13 years. He did not know that the road had been opened by the authorities so as to show the pipes. He thought the granite and pitched crossing would give a resistance equal to 30 inches of ordinary road.

Cross-examined by Sir H. JAMES: The pipes were originally laid in 1818, and it had been his duty to maintain and preserve them. If he found the pipes faulty or the soil defective, he had, as far as he could, remedied it. The depth at which gas-pipes were now laid was 18 inches. That was the ordinary contract depth, dependent on the soil. That practice first came into existence under the Brighton and Hove Company's Act of 1839. When he referred to the resistance of the concrete, he meant the concrete and the granite, and his opinion was based on his general experience. The ordinary way of laying gas-pipes was to dig down and form a good bed. If this foundation failed it endangered the pipe. If, therefore, from any cause, the bedding of the pipe was destroyed by flow of water, the pipe became fractured. This had occurred in Ship Street, the soil of which was the worst in Brighton. There had been a general subsidence of the road there, which was composed of shingle and sand. He did not think the ordinary traffic of the street would be sufficient to cause a fracture, but if a heavy waggon, with narrow wheels, passed over such a soil, it would be likely to cause a fracture. The Company's officers were continually about the town, and, if they found any place where the soil was giving way, they would take means to remedy the evil, but they would not make an examination of the ground, unless there was some visible sign of that kind, or an escape of gas.

Re-examined by Serjeant PARRY, witness said he thought the steam-roller going over the road would be likely to fracture the pipe. The pressure of the roller was 17 tons. He had never received instructions from the Corporation of Brighton to lower the pipes in Market Street, nor had he had any complaint of any kind. No accident had happened in Market Street before the roller went over the road. There was a sewer running down Market Street, constructed in 1865. In the construction of that sewer he did not know whether the pipes were laid bare.

Richard Rogers said he was a pipe-layer in the employment of the Company. He went immediately after the explosion to Market Street. He opened the ground, and found the top of the crossing not disturbed, but the main was broken, and the earth under it washed away. He cut out a length of 9 feet, and carefully looked at the fracture. It was a perfectly clean one; there was no crack in it, but it had snapped asunder. It was a new fracture. He dug down to the water-pipe, 11 inches below. There were two water-pipes, and one of them was broken—the lower one, which was 11 inches below the gas-pipe. He examined the broken water-pipe; it looked as if the pipe had been leaking for a long time; it did not look like a new fracture.

Cross-examined: The upper water-pipe was not broken, but the lower one was completely fractured. It appeared as if the water had been escaping from it for some days. The soil had become wet, and had got moved and washed away all along the shingle from underneath the gas-pipe, so that it was left without any sufficient support, and would easily break. The pipes were likely to break, if unsupported in proportion to their length.

Re-examined by Serjeant PARRY: The water-pipes in Market Street were put to rights by the Corporation. In his judgment the water had washed away the soil on the morning of the explosion.

Thomas Rogers said he was a son of the last witness, and went to the scene of the accident immediately after it occurred. He agreed with his father as to the cause and appearance of the fracture.

Mr. C. Sandeman, examined by Mr. Inderwick, said he was Chief Inspector to the Brighton and Hove Gas Company. He was quickly on the spot after the explosion, and saw the gas-pipe taken up. It was a sound pipe, and the fracture was a new one. As to the fracture of the water-pipe, he differed from other witnesses. He did not believe it to be an old one, but newly made that morning. He had made notes of the condition of the soil and position of the pipes, and his opinion was that it would be unsafe to use a steam-roller there.

Cross-examined by Sir HENRY JAMES: The pipes would be so oxidized when they were brought out that it would be difficult to tell the age of the fracture. He did not see the fracture until after the pipe was removed.

Re-examined by Mr. Inderwick: He was there about 20 minutes past ten, and up to five o'clock the pipe had not been taken up. It would take about 15 minutes for the water to carry away the soil, after the bursting of the pipe. The oxidation would not prevent him from forming an opinion as to whether the fracture was a recent one or not.

Mr. Arthur Loader, examined by Serjeant PARRY, said he was an architect and surveyor, residing at Brighton, where he had practised for ten years. Previously he was in the service of the Corporation for eight years. He remembered the road in Market Street being opened in 1865, for the purposes of putting in a sewer. The water and gas mains were then laid bare and exposed to view. The work was done by a Contractor, under the superintendence of the Town Surveyor. The soil in Market Street was not good, being loamy. The road was rather "barrelled," and from the crown taking the lighter traffic, would be less consolidated in the centre than the sides. The steam-roller measured 6 feet 6 inches from the outer edge of one wheel to that of the other, and it weighed 15 tons, which weight would be increased when containing water and fuel. Such a roller being used in Market Street would be likely to break the pipe.

Cross-examined by Sir HENRY JAMES: He would not say that whenever the roller went over the road it would be likely to break it. He thought it might do so. He never heard that the roller had been over it before, and he would be astonished to learn that it had gone over it many times. He thought the leakage would add to the danger. The sewer-repairing was done by Messrs. Cheeseman in 1865, and the crossing was at that time about 20 feet from the sewers, so that the condition underneath the crossing would be laid bare. They worked altogether 63 feet. He recollected now that they came down so far as the crossing. He had had no experience beyond Brighton with reference to the use of steam-rollers. The broader the distribution of the weight, the less likely was the roller to be dangerous. In 1865 the gas and water pipes were exposed; but he could not say whether the work came down to the crossing, but he thought it did. He could not say positively that the pipes were exposed under the crossing. It was not possible, that he could see, to lay the concrete on the crossing without exposing the pipes.

Mr. J. A. Freeman, Town Clerk of Brighton, examined by Serjeant PARRY, said he conducted the case for the Brighton Corporation. He produced a book with entries in it. They called it the "Steam-Roller Book." It was kept by the Surveyor of Highways, Mr. Neale, who looked after the steam-roller, and was in the employ of the Corporation. The entries in the book were made from time to time.

Serjeant PARRY here proposed to put in the book, but

His LORDSHIP said, as Mr. Neale was present, he did not know whether it was admissible.

Witness said the handwriting in the book was Mr. Neale's.

Serjeant PARRY pressed the evidence, and Sir HENRY JAMES objected. After some discussion, however, extracts were read from the book, showing that the gas and water pipes in several parts of the town had been reported broken after the steam-roller had been at work over them.

Sir HENRY JAMES drew attention to entries of the roller having been at

work in Market Street without any memoranda of damage having been done. There was an entry of March 2, 1871, which was to the effect that the roller had been rolling all day, and several gas-pipes had been injured. On the 29th of March of the same year, most of the pipes in Church Street and Trafalgar Street were old and decayed, and the steam-roller soon found them out. On the 3rd of April the roller stuck into a soft place, and refused to come out. Other extracts showed that several pipes, man-holes, &c., were injured at various dates. The extracts extended from 1871 to 1876.

Serjeant PARRY called attention to the fact that in March and April, 1872, the engine was at work in Market Street.

Sir HENRY JAMES said in September, 1874, the steam-roller was again rolling in Market Street, and also in February, 1875, and in the July of that year.

Serjeant PARRY read an entry of March 14, to the effect that the roller had been in use in Market Street two hours, and referred to the breakage of gas, and the explosion.

Mr. Freeman was recalled by Sir HENRY JAMES, and said there had been a report that there had been a gas explosion in Market Street in January of the present year, and that no steam-roller was used.

Mr. Sandeman was recalled, and said he went to the spot and found the gas had escaped on the occasion referred to. It was in the month of January, 1878, and the escape was under the very crossing, and was from a joint. He attributed it to the ground being improperly filled in by the Corporation.

By Serjeant PARRY: There was only a slight smell, and it was easily remedied. At Market Street the gas-pipes would be about 3 feet deep.

Sir HENRY JAMES submitted that there was no case to go to the Jury, inasmuch as the Locomotives Act (to which Serjeant PARRY had drawn attention, and had alluded in his opening speech) did not apply to such machines as that used by the Corporation. It applied only, he contended, to steam-engines used for agricultural purposes, and not to machines used in road-making, as the clauses of the Act made mention of the "waggons behind them." He also submitted that the Gas Company, though they might have power to lay down pipes in the road, must lay them and maintain them in such a manner that no injury should accrue to those using the surface. There might be, he said, vested in the Corporation a right of supervision over the Company in laying the pipes, but the primary duty was with the Company; for if they had laid pipes in any part at a depth of only 3 inches, and it had escaped the notice of the Corporation, the Gas Company would most certainly be liable for any accident that might occur to the surface, the user of which was in the public.

His LORDSHIP: You maintain that the Gas Company must lay their pipes at such a depth that any weight passing along the road should not injure them?

Sir HENRY JAMES replied that, if it were necessary to do so, he should be prepared to go to that length; for no Company had any right to limit the use of the surface of the road.

His LORDSHIP: Then your argument is that the Gas Company are the proper parties to be sued?

Sir HENRY JAMES: Just so, my lord.

His LORDSHIP: I shall take the opinion of the Jury on the question of fact.

This was the case for the plaintiff. No witnesses were called for the Corporation.

Serjeant PARRY, in addressing the Jury for the plaintiff, said that all the questions of fact were pretty well admitted, and the only question left to them was whether there had been negligence on the part of the defendants. He asked the Jury if they had any doubt that the fracture of the pipe was caused by the roller, and that the explosion was in consequence. There had been a lame attempt to show that there had been explosions without the roller; but the reports were vague and unsatisfactory, for these were only small escapes of gas. He submitted that it was conclusively proved that the roller did cause the fracture, that the fracture caused the explosion, and that the explosion caused the damage, the liability for which they were called upon to decide. He commented on the absence of witnesses on the part of the Corporation. He thought that fact alone was significant. He argued that the roller was a highly destructive roller, and a dangerous machine. It had been suggested that this locomotive did not come within the scope of the Act—that it was not a traction-engine. If that were so, the position of his friend, in representing it, was that he was representing a public nuisance. It was set up without a right of authority, if what his friend argued was right. He thought the mere use of such a machine was an offence, unless sanctioned by Act of Parliament, and would involve a liability. That was the character of the engine. What was the character of the street? Why did not Mr. Lockwood come into the box, and say that he authorized the use of it? Why was it that none of the Corporation officials came into the witness-box? He contended that the Corporation relied for a verdict on a mere speech, and the argument that the Gas Company were liable for the damage. If the Corporation had put such witnesses into the box, he could have ascertained from them as to what precautions they had taken; but, as it appeared to him, what the Corporation had done was to send three or four ignorant, unscientific, and unskilled men to this street, without consideration, to work it for so many years. He pointed out the nature of the soil in the different streets, and asked if the neglecting of precautions in reference to this did not constitute very great negligence. Why were not the men called who had been in charge of the engine? The men who drove the engine must have known that the steam-roller had broken the water-pipe, and must they not have known that the gas-pipes were above? They might reply that they did not know; they went on with their work. But did not this constitute dire and gross negligence? It was not too early to call up a surveyor, and take advice as to what should be done. It could not be said that the servants of the Corporation did not know that the water-pipe was broken. He complained that all these people had not been called. It was not a mere sentimental contest as to who should obtain a verdict, but a contest of facts. The Corporation and their officials were bound to know of the existence of these pipes, and they were either reckless in the use of the engine, knowing these facts, or ignorant of them, in which case their ignorance constituted a liability. It had been said that the washing away of the subsoil had contributed to the disaster; but the water-pipes were the property of the Corporation, and they could not set up gross negligence of their own in reply to a charge of gross negligence. With reference to the Gas Company's liability, he would not be afraid to be counsel for them in case they were the defendants; but he urged that if there were any dispute between the two—the Corporation of Brighton and the Gas Company—it had nothing to do with Mr. Pocock. But were the Gas Company to blame? He did not think so. This pipe, originally laid in 1818, had always gone as a sober, respectable, steady-working pipe, and it had been laid at a fair distance beneath the surface. The pipe was as perfect a pipe as had ever been laid down; and then, as Mr. Rutter had stated, the resistance of that cross road was such that it could stand more than ordinary wear. It was the weight of this extraordinary engine that had caused the fracture, there was no doubt. Referring to the book which he had put in, he said such a book must be



evidence against those who made it up. Did they ever read a more scandalous account of a machine than that which he had read? Supposing they had a restive horse, which had broken loose and injured some one, would it not be vital to the question that the owner of the horse should know its character? and was it not vital that the Corporation of Brighton should know the character and temper of this engine? Here were all the entries, and yet somehow it appeared that none of the Corporation knew, or else that, month after month, or year after year, they were using an engine that they knew was of a dangerous and destructive character. He had a great respect for the Corporation of Brighton, and he thought their attention had not been called to the various delinquencies of the steam-roller, and he hoped this action would have the effect of opening their eyes in that respect. In conclusion, he expressed a belief that, after all that had been said, the Jury would come round to the opinion that the plaintiff had been seriously injured, and they would unhesitatingly return a verdict for the plaintiff.

Sir HENRY JAMES, for the defence, said the question to be decided was one of liability. The Corporation only did a public duty in contesting the claim of the Insurance Companies. It was alleged that the defendants had used the roller negligently, and had done the damage which ensued in consequence. But he contended that there was not a tittle of evidence to show that there had been any improper use of the steam-roller; and if there was a bad soil—a shifting soil, as this had been proved to be—it told with far greater force in favour of his point, that the Corporation had been guilty of no negligence. Endeavours had been made to show that the engine had been stopped on the King's Road crossing on that very morning; but what had Mr. Rutter stated? That 13 inches of granite and concrete gave a resisting power equal to 80 inches of soil; and that showed that the crossing was the most proper place on which the engine should rest when necessary to stop it. Then what was the fact proved by the book which had been put in? That the roller, previous to the day in question, had been eight times in Market Street without any escape of gas being caused by it; also that pipes were known to have been broken from want of support—by a subsidence of soil. If it was illegal to use this machine in Brighton, it was illegal to use it in London, or any other town. If it had been a larger-sized roller than the one in use in any other towns, surely it would have been proved. As to the statutes referred to by Serjeant Parry, they were not applicable to steam-rollers; they referred simply to the locomotives connected with waggons. The gross weight of the engine amounted to only 14 tons—less than that sanctioned by the Legislature. It was known to all of them that for the sake of economy and better workmanship in every town in England, these steam-rollers had been adopted; and the Corporation of Brighton would have been censured if they did not adopt this latest and cheapest means of doing the work, instead of continuing the old fashion. If the engine had been an improper one, would it not have been complained of by the Gas Companies, the Insurance Companies, the Water Companies, or the Ratepayers? Yet, with all these and their observations, not a single complaint had been made to the Corporation of Brighton. The after-wisdom of all these gentlemen, and of all these bodies, was a thing easy to possess; but if the Corporation of Brighton knew all that was going on, did not all these people know it too? The Gas Company were not to be the critics of the Corporation; they were the participants in what they did. He put to the Jury the point that what they had to decide was the negligent act of the Corporation in this particular case. He pointed out the difficulty of knowing what was going on underground. It had been said that it was dangerous to send the engine down Market Street, because it was a narrow street, but he argued that it was not more dangerous than a wide one, unless there were cellars beneath, and the engine were to go upon the arches of the cellar. It was not more dangerous than the King's Road in the matter of the gas-pipes, because the same pressure came upon the face of the pipes in the broadest as the narrowest street. It had been shown that the engine had gone over the same ground before, and if there was no negligence then, how much less was there in having it on this particular place, where the resistance was so much greater. He thought they could trace the cause of the accident to a condition apart from the roller altogether, and that was to the shifty nature of the soil. He instanced the subsidence of the soil in Ship Street. He asked why the water-pipe nearest the surface of the road did not break. It had the weight of the roller, which, it was alleged, had broken the one beneath it. In conclusion, he argued that it was the duty of the Gas Company, as a trading company, to look after their pipes, rather than the Corporation, as the representatives of a body of ratepayers.

SATURDAY, MARCH 2.

His LORDSHIP, at the sitting of the Court, proceeded to sum up the case, pointing out to the Jury, in the first place, the questions at issue between plaintiff and defendants. The only question, he said, for them to decide really was whether the defendants had been guilty of negligence. The case was one of a peculiar nature, and by no means free from difficulty. The defendants were the owners, so to speak, of the road in Market Street, and also the owners of the water-pipes. He drew their attention to the circumstances of the explosion, and said it was admitted that the gas-pipe was fractured and that the explosion occurred in consequence, but it was not admitted that the fracture resulted from the pressure of the steam-roller. But there seemed to be no doubt on that point, according to the evidence. Assuming, then, that the use of the steam-roller did cause the accident, what had they to determine? There was evidence to show that the street was not of the soundest character, and they would have to bear in mind what was the stated knowledge of the Corporation as to that street at this time. It had been said that the steam-roller was now in common use; and this was true. It was adopted in most towns, and it had been suggested by the counsel for the plaintiff that the use of it was a nuisance. Acts of Parliament had been referred to also with reference to the use of it. He should tell them that in point of law there was no objection to the use of it for the purpose of putting the streets into order. The only conditions imposed by the Legislature, by the Acts of 1861 and 1865, were that it should only be of a certain weight, and that it should only be moved with the permission of the Corporation. In 1861 the weight fixed by the Act was 10 tons, and in 1865 it was fixed at 14 tons. In this case the Corporation, being the Local Authority, used it, giving themselves, as it were, leave to use it. They had the fact that the engine was used by them, and there was nothing illegal in it. It did not matter what the weight was, it might be 40 tons; but it was the duty of those who used it to exercise reasonable care—knowing the character of the soil, and that gas and water pipes were there—in the use of the instrument. It was known at the time of the accident that the pipes had burst; but the soil was shifty, and the duty of the defendants being to use all reasonable and proper care to ascertain the condition and character—for that was a very important matter—it was for the Jury to consider whether they had the knowledge to apprehend danger, or whether they had the means of ascertaining that danger. For, according to the law, the Corporation were bound to use the means they had at hand to ascertain the character of the soil and the position of the pipes. They had a Borough Surveyor and other officials who might have given them this information. They had this information undoubtedly, and they had not chosen to call the officials. If they had

such information, and there was no doubt they had, it was for the Jury to consider whether that was a reason for the Corporation to put their Borough Surveyor to ascertain the state of the road before the use of the steam-roller on that particular road. If they assumed that there was no want of care by the men who had the actual charge of the engine, the actual users, supposing they used it with reasonable care, the question still remained, was it safe and proper to use the engine on the surface above the pipes? A great deal had been said about the engine going over the crossing, but it did not appear to matter much as to the position, for the pipes were not in the centre, and they could form no accurate notion of where the pressure would be. They could narrow the inquiry to the crossing, for it was this spot that was chosen for bringing the engine to a stoppage. It had been said that it was dangerous to do this, one of the witnesses going the length of saying that there was sure to be an accident. That ought to be gravely considered, and it was only reasonable to suppose that they would have heard from the Surveyor what the Corporation knew of the state of the crossing. But they had not had any evidence of that kind. The question—it being the duty of the Corporation to ascertain the fact of whether it was safe to use the engine—was whether they had performed their duty, because their duty was the mere knowledge before the fact; and if they had done their duty, the mere after-knowledge of the fact that it did break would not affect them. What was the state of their knowledge with regard to the water-pipe? Did they know the water was escaping? Did they know that they were sending the roller on to the spot, knowing that the water was escaping, knowing the state of the soil, and knowing that it was dangerous? The great point on the part of the defendants was that the Gas Company, having laid their pipes there, were bound to provide them so as to resist any weight; and that although, in 1818 they were laid there to a certain depth, they had only a right to do so subject to the Corporation being able to put a 15-ton roller over them. He did not think that was so. He did not think that they had to lay pipes to resist weights of this kind. He thought it was rather the duty of the Corporation to see that they did not break the pipes, that they should repair the road without endangering the pipes; that, above all, they had no right to send the engine there without ascertaining the safety of the pipes. It was not correct, in point of law, to say that the Gas Company were compelled to take precautions against the breakage of their pipes by steam-rollers. Taking all those circumstances into consideration, it was for them to say whether the Corporation had acted negligently in sending the engine on to that spot. It was in 1865 that the sewers were repaired, and at that time they evidently knew in what condition the pipes were. His lordship then reviewed the evidence of the circumstances attending the explosion, and remarked that one point was that the engine was worked to and fro the street after the water-pipe had burst, and the people who had charge of the engine knew it. He commented on the fact that the roller had been on the same crossing in 1872, and had then made a breakage in the pipes; and also upon the discrepancy in the evidence as to the breaking of the water-pipe—whether it had been broken that morning or before. That, however, had no effect upon the case. Supposing the pipe had been broken before, that had nothing to do with the question, except in this way—that the engine had been proved to be a constant source of annoyance and injury. It was not sufficient for the Corporation to say, "We have sent the engine that has broken the pipe and washed away the soil, and broken the gas-pipe that caused the explosion, but the Gas Company are liable." It was in evidence that the rollers had been year after year, and month after month, crushing pipes, and therefore the Corporation knew what was going on. He read the principal extracts from the "Steam-Roller Book," and said they showed that great caution ought to be exercised. On the other hand, he noticed the several occasions on which the roller had been in Market Street without doing damage. It would be for the Jury to say whether the Corporation had exercised due and proper care to ensure the safety of the pipes in the use of the roller, or whether they, knowing the state of the facts, had not done so. They had been told that the Insurance Companies brought the action, and that it was brought on behalf of the sufferers; but the Gas Company had also a great interest in the matter. They were quite right in bringing the action. That, however, had nothing to do with the Jury; all they had to do was to try the case as between man and man, not considering whether either was rich or poor; all they had to do was to consider whether the defendants had known that there was danger in the use of the engine, or had means of knowing it and had neglected to take the due precautions which that knowledge necessitated. If they thought this they would give a verdict for the plaintiff, and if they did not they would return a verdict for the defendants.

The Jury then retired, and on their return into Court gave a verdict for the plaintiff.

Judgment was reserved, the plaintiff to move for same when the amount of damage has been ascertained.

#### SOUTHWARK POLICE COURT.—SATURDAY, MARCH 2. (Before Mr. PARTRIDGE.)

LADBURY v. THE SOUTHWARK AND VAUXHALL WATER COMPANY.

In this case the defendants were summoned for that they, "being the undertakers to supply water, refused to furnish a full and sufficient supply during the time for which the rates for such supply had been tendered."

Mr. CLARKE, in opening the case for the plaintiff, said: I appear in support of a summons issued against the Southwark and Vauxhall Water Company, on account of some excessively high-handed proceedings that have been taken by them, and there are very serious questions which you may have to decide in the course of the case. Upon whichever point the decision is taken, I think it will be found to be a very substantial and important point; and I must say that at the conclusion, if I succeed in establishing the case in support of which the summons has been taken out, I shall ask you not merely to decide in my favour, but to give some indication of your opinion with reference to the proceedings. The complaint is made against the Southwark and Vauxhall Water Company, for that they, being the undertakers to supply water within the parish of Southwark, "did unlawfully neglect or refuse to furnish to the said J. Bolton Ladbury, entitled to receive a supply of water, a full and sufficient supply during the time for which the rates for which supply had been tendered by him." The prosecution rests upon the 43rd section of an Act of Parliament, which is incorporated into a private Act, a copy of which, I believe, is now before your worship. The Act is called "The Water Works Clauses Act, 10 Vict., cap. 17." In that Act it is provided, by the 43rd section, that if the undertakers neglect or refuse to fix or maintain fire-plugs, or neglect or refuse to furnish any owner or occupier entitled to receive a supply of water during any part of the time for which the rates for such supply have been paid, they shall be liable to a penalty of £10, and 40s. for each day that such neglect exists. Upon that section of the summons which has been taken out, it is my duty to show that Mr. Ladbury was a person entitled to receive a supply of water; that the rate for the payment of that supply had been paid or tendered; and that, notwithstanding the fact of the payment of the rate, the water was cut off. Two questions will have to come before you in reference to this matter. Upon examination of the private Act of Parliament which is before you, you will find by the 53rd section that the Com-



pany shall, at the request of the owner or occupier of any part of a house, furnish to the said persons, by means of communicating-pipes, a sufficient supply of water for his domestic purposes, "at the rate per cent. and per annum of the value of the house, not exceeding £5." With regard to manufacturing places there is a different provision—that water may be supplied by meter, with a certain charge upon the water so supplied; but that question does not arise in this case. The water is to be supplied for domestic purposes, and paid for at the rate per cent. and per annum on the annual value of the house, not exceeding £5. I do not find anything in this Act, to which I have drawn your attention, which provides that the Southwark and Vauxhall Water Company, the undertakers, shall have power within that limit to make any arbitrary charge they like in respect of the water supply. The way in which the water is to be paid for is to be a rate upon the annual value of the house. It is provided that under no circumstances shall a rate so fixed exceed 5 per cent. per annum. It does not arise upon the clause I have quoted whether the Company, having once fixed the rate with reference to the actual domestic use—the water for domestic purposes—they are entitled, although there is no increase in the supply or in the consumption of water, to increase the charge they make for it, simply because the rental value of the house has been increased. I shall just mention one or two instances, and show exactly the question which on this part of the case arises. For years, of course, this Company have supplied the inhabitants of the Borough with water. In many cases premises upon which a water supply has been given have been increased in value by the natural increment of value which occurs in the Borough. In some cases the premises themselves have been materially altered, and while there has been no increase of consumption of water for domestic purposes, through alterations which have been made for the purpose of trade, the rental value of the houses has been very much increased. It has recently come to the minds of the advisers of the Water Company that they should take advantage of this, and should put upon the water that they supply to a good many of these gentlemen in Court an arbitrary and perfectly ridiculous charge. In one case, for instance, £3 15s. 9d. was the charge made up to Lady-day, 1877. On that day the rate was increased to £27 per annum, there having been no increase in the consumption of water for domestic purposes, and the increased charge being made simply because it was considered by the advisers of the Company that the provisions of the Act of Parliament were so incautiously drawn as to give them the power of making this arbitrary charge.

MR. PARTRIDGE: It does not affect the case; but how do you account for the increased rental?

MR. CLARKE: It is in many cases owing to the premises having been rebuilt. They are premises used chiefly for business purposes. There has been no increase in the actual domestic occupation, but in the business done. Let me tell you of another case, where there can be no question of the kind. At the district branch of the London and Westminster Bank the rate was £47 a year, and that had been increased to £100 a year. I will make the fullest possible admission, that where the Water Company found that there was an increase of consumption they would be justified in increasing the charge, but in the case of a bank there can be no question of increased consumption. I may mention to you the case of the district branch of the London and County Bank, and the London Joint-Stock Bank. These two banks were rated at £30, and the sum is now increased to £70. There is only one other instance with which I will trouble you. The Hibernian Chambers were rated at £35, and now the charge made is £120 a year, there having been no increase in the consumption.

MR. PARTRIDGE: In this case, do you say that the Company exceed the limit prescribed by their Act of Parliament?

MR. CLARKE: I do not say that they exceed the 5 per cent. per annum, but I say that, giving a reasonable construction of the Act of Parliament, they are not entitled to raise the rates in such amounts as I have mentioned, except with a reasonable reference to the use that may be made of water for domestic purposes.

MR. PARTRIDGE: To what section do you refer?

MR. CLARKE: To section 53 of their private Act, which says, "The Company shall, at the request of the owner or occupier of any part of the house occupied as a separate tenement, or to any other person who shall be entitled to demand a supply, furnish to such person by means of pipes and other necessary means, a sufficient supply of water for his domestic purposes," at a rate per cent. and per annum on the annual value of the house not exceeding £5; £5 is, therefore, the limit. How is the rate to be fixed, or with reference to what is it to be fixed below that? The question is whether, under the limit of 5 per cent. per annum, they have an absolute and arbitrary discretion as to what rate they will charge, and that is the important question which may be involved in the decision of the matter before you to-day. What I suggest to your judicial decision is this: This Act of Parliament, taken in connection with the public Act, gives the Water Company a monopoly. They are absolute monopolists, from whom people must get their water if they get it from anybody. They are bound to give the water to anybody at a limit, not a rate, which has been fixed by Parliament. The limit being fixed, by whom, and with reference to what, is the rate to be fixed? I submit, in the absence of any distinct words giving an absolute and arbitrary discretion of this kind to the Water Company that it would be exceedingly reasonable to construe the Act of Parliament as enabling them to decide their charge for domestic purposes entirely with reference to the rental value of the house, because, looking at the facts, the Water Company are in this position: They have laid down their mains and their communications. They supply, let us say, for domestic purposes, some twelve persons in a particular house. So long as the number of persons remains the same, the expense which the Water Company incur year by year does not increase, but probably diminishes; and it would be surely unreasonable to allow the test to be applied at the discretion of the Water Company, who have nothing to do with the service they are rendering. If a man puts up a large show-room at the back of his premises, he increases enormously the rental value of the premises. That has nothing to do with the supply of water; and what I contend is this, that these rates must be reasonable rates, fixed with reference to the consumption of tenants for domestic purposes. It may be said that there is great difficulty in fixing these reasonable rates. I answer that the difficulty does not occur in this case, because the Company deal with the same consumption for domestic purposes. They fixed a reasonable rate in the charges they made before, and the increase they now make is entirely arbitrary, and irrespective of any service they render. I think you will agree at once that, whatever the decision of this question may be, it is one of great importance to very many occupiers, who are calling attention to these charges, which my learned friend will not be inclined to deny. At this moment it is the supreme desire of the Companies to increase their rates, in order to establish a claim for enormous compensation under certain Bills now before Parliament.

MR. PARTRIDGE: This is a purely dry question of law, and I have to decide between the Water Company and the public.

MR. CLARKE: It is in that spirit that I endeavour to present it.

MR. PARTRIDGE: The only reason I mention this is that certain bills have been published, one of which has been laid before me. We have nothing to do with these. This is not a private, but a public matter.

MR. CLARKE: It is a matter, no doubt, in which the public are largely interested. Dealing with the main question, I will point out to you the circumstances under which the summons has been taken out. As I have said, it is provided, in the section which I read, that, in the event of the neglect or refusal of the undertakers to furnish water to an owner who has paid or tendered the rate, the Company shall be liable to a penalty. In this case, the plaintiff occupies premises supplied with water by the Southwark and Vauxhall Water Company. He was originally charged seven guineas per year. Last year—that is to say, for the half year from Lady-day to Michaelmas,—he received notice that the rate for water would be increased to £16 5s. He remonstrated against the charge, and in reply to that he received a letter from Mr. Payne, Supervisor to the Company. It is dated Nov. 16, 1877, and states that he (Mr. Payne) is instructed to inform the plaintiff that the question of his rating has been submitted to the Board, and the proper charge would be £16 5s. I pause here simply to say that the Act of Parliament does not say that the charge of 5 per cent. upon the rental is a "proper" charge; it is a maximum charge. The letter continues: "But, after full consideration of the circumstances, I am authorized to fix the rate at £11 per annum." On the 11th of February, plaintiff received the following notice from the Company, printed in red letters:—

"Final Application. Southwark and Vauxhall Water Company, Sumner Street, Southwark Bridge Road. To Mr. Ladbury. Notice. It is absolutely necessary that this rate be paid within seven days from the date herein, Feb. 11, 1878. Application is made for £5 10s., for two quarters water-rate, due Michaelmas, 1877. Unless the amount be duly paid, the supply of water will be discontinued."

In answer to that notice, plaintiff sent a cheque for £5 10s. to the supervisor, who returned the same, with an intimation that it was not drawn for the proper amount, and requesting that the sum applied for might be at once forwarded. Now the amount applied for was actually £5 10s.; nevertheless the cheque was returned, and on the 27th of the month the Company cut off the supply of water to the plaintiff's premises.

MR. M'COLL, who appeared for the defendants, said: After the letter and the tender of the cheque, it will be impossible for me to contest this case. I am instructed that when the cheque was returned, Mr. Payne was very busy, and he returned it under the impression that it was drawn for a less amount—the original amount of seven guineas.

MR. CLARKE: Really that is a most astonishing statement. Mr. Payne ought to have looked at the cheque.

MR. PARTRIDGE: I think, Mr. M'Coll, you had better go on with the case.

MR. M'COLL: I cannot go on.

MR. CLARKE, in continuation, said: On the 27th of February the water was cut off. On the following day the plaintiff, along with Mr. Birt, who is now instructing me, went to the Company's offices and tendered £5 10s., which was to cover the half year from Michaelmas to Lady-day. The time for which the rates were tendered by Mr. Birt was the time at which the water ought actually to have been supplied, but was not; so that from the 27th of February until this moment the plaintiff, having his water cut off, and being deprived of water, has been refused a supply within the meaning of the Act of Parliament. Apart from any question of fine which you, sir, may think fit to inflict, the Company are bound to forfeit to any person who has paid or tendered the rate, a sum of 40s. for each day during which the water is cut off. Upon the plaintiff tendering £5 10s., the officer to whom he made the tender refused to accept it, on the ground that the previous half year had not been paid. That being so, and after the admission made by the learned counsel, I think the only question will be as to the number of days during which the plaintiff has been without water.

MR. J. Bolton Ladbury, the plaintiff, said: I am a draper, carrying on business at 20, High Street, Borough. Down to the half year beginning Lady-day, 1877, I had paid seven guineas a year to the Company for my water. After that, I did not increase the consumption of water for domestic purposes in my house. On Feb. 11, I received notice stating that the amount charged would be £11. I then sent a cheque to Mr. Payne for £5 10s. I received it back, enclosed in the letter of Feb. 18, which has been read. The water supply was cut off on Feb. 27. On Feb. 28, I went with Mr. Birt to the offices of the Company, and tendered £5 10s. as payment for the half year from Michaelmas to Lady-day. That was refused, on the ground that they wanted the Michaelmas half year paid first.

Cross-examined by MR. M'COLL: When I got notice that the rate had been reduced from £16 to £11, I had not determined not to pay. I had never been applied to for the money until the day when I received the red letter notice. When I went to the offices of the Company on Feb. 28, I tendered a Bank of England note for £5, and half a sovereign, to Mr. Payne, who said, "I accept this as a tender." He would not take it, he said, because the previous half year had not been paid.

By the MAGISTRATE: I am still without water. There are ten persons in my house. Fortunately, mine is rather a large cistern, and it was not empty until last night.

MR. Daniel Birt, solicitor, having given corroborative evidence, the case for the plaintiff was closed.

MR. M'COLL, for the defendants, called

MR. G. N. Payne, who said: I am supervisor to the Southwark and Vauxhall Water Company. I remember the application that was made by Mr. Ladbury to have the rate decreased. It was decreased to £11. I have not the slightest doubt that application was made for the money, but I cannot prove it. The red letter notice is never issued until three or four applications have been made. On the 16th of February, a cheque for £5 10s. was sent, but I do not remember it, having had 20 or 30 on the same day. The cheque was sent back. I signed the letter in which it was enclosed, but it was an inadvertence. I did not know the cheque was for £5 10s.

Cross-examined by MR. CLARKE: I have to check rates and maintain rates under the sanction of the Board. When I say that, I should say that I lay them before the Board for approval. I do not suggest the rates. I produced £16 5s. as the rate to be fixed, according to plaintiff's rental, and the Board sanctioned it. The £16 5s. is made up in this way. Plaintiff's annual value is £300, according to the parish rate-books. He has two water-closets, which are 15s., and he has one high service, which is 10s. These items together make up the £16 5s. Plaintiff has paid seven guineas for, I should think, ten or twelve years. It was not my duty to inquire whether he had been increasing his consumption; the rate-book was my guide.

MR. Wright, a collector, proved that he had made several applications to plaintiff for payment of his water-rate.

MR. M'COLL, in addressing the Bench for the Company, said: The case merely resolves itself into a question whether the Southwark and Vauxhall Water Company have acted so as to bring themselves within the section of the Act of Parliament. It has been proved, beyond all question, that this was the purest case of inadvertence. The rate having been levied, Mr. Payne receives upon a certain day, long after the rate had become due, a cheque. According to his own admission, plaintiff had determined not to pay it. He sends a cheque for the amount, which gets into Mr. Payne's hands, and is returned in mistake along with a great number of other cheques, all of which were insufficient in amount. Of course, if a



claim were made here for damage sustained by the plaintiff, perhaps the argument I am advancing would not be a cogent one; but I venture to think that it is not your duty to repair the damage he has sustained, but to mark your sense, by means of a penalty, where the Company, as monopolists, use their power excessively. I venture to think that the application of these penalties was never intended to meet a case where the cutting off of the water was an act of the purest inadvertence, contributed to by the neglect to pay. After a red letter notice was sent, the plaintiff certainly did pay; but from the 16th of November, when, upon his own application, the rate was decreased, until the 16th of February, when the cheque was sent, he does not suggest that he ever intended to pay, or would have paid, if he could have avoided it. No doubt Mr. Payne committed a great inadvertence in returning the cheque, but I venture to think that in this case the penalty does not apply. When my friend says he is entitled to the penalty, I venture to think you will not listen to him. The Act of Parliament, no doubt, says the Company are liable to the penalty, but it does not say that in every case the magistrate before whom a case of this kind comes shall inflict the full amount of the penalty. The Act merely gives you the right to inflict a penalty in a case where you think it is necessary.

Mr. PARTRIDGE: These proceedings are taken under the Southwark and Vauxhall Water Act of 1852, with which is incorporated the Water-Works Clauses Act of 1847. The case is really more one of fact than of law, because the question of rate, which may arise in another case, does not arise here. The case comes within two sections, the 43rd and the 73rd of the general Act. The 43rd section states that the neglect or refusal to fix or maintain such fire-plugs as ought to be furnished to the town commissioners for a supply of water, or if through neglect the pipes are not charged, or an owner or occupier who is entitled to receive a supply of water during any time or part of the time when the rates for such have been tendered, is refused such supply, the company shall be liable to a penalty of £10, and shall also forfeit to the town commissioners, and to every person having paid or tendered the rate, the sum of 40s. for every day during which such refusal or neglect shall continue. That is the section which sets out the duty of the undertaker as well as the owner and occupier—the undertakers to supply, and the owners or occupiers to pay or tender the rate. I need not go into the question of rate now, because there is no dispute as to the amount. Then the 74th section shows what the rights of the undertakers are as to cutting off the supply. It states that if any person supplied with water by the undertakers neglect to pay such water-rate at any of the times of payment, the undertakers may stop the water from flowing into the premises by cutting off the pipes, or by such means as the undertakers shall think fit. These are the powers of the Water Company as regards cutting off. The words "neglect to pay such water-rate," must be read and taken in connection with section 43, in which these larger words are included—viz., "pay or tender." The question I have now to decide is, whether on the 27th day of February the Water Company were justified in cutting off this water supply. After certain evidence, it is admitted, as proved by the complainant in this case—his evidence being corroborated by the evidence of Mr. Birt—that the water-rate for the ensuing quarter, up to March, was tendered and refused. There is no denial in that, as I understand all the Water Company say is that it was a mistake of their officer. Of course that mistake is inconvenient; but neither the public nor the present complainant must be damaged by the error of any officer in the Water Company's service. The Water Company are amenable for all the acts of their officers; and, according to the evidence, there were in the house nine or ten persons who had been deprived of a supply of water for four days, from the 27th of February to the present day. Now it does seem to me that it is a very serious thing indeed, because in this case the Water Company have a monopoly. I do not know whether any other persons supply water within the district; but, at any rate, there are the Southwark and Vauxhall Water Company, therefore, I suppose, the public in this district draw their supplies chiefly from that Company. Taking a dry magisterial view of the case, apart from any private feeling, it does seem to me, in a sanitary point of view, a very serious thing for the Water Company to deprive the inhabitants of a full and efficient supply of water—which seems to me as necessary as the air we breathe for the purpose of health and in the public interest generally. Therefore, if the Water Company have made the mistake in this matter which it seems to me they have, it is no answer to say that one of their officials has been in error; they must suffer for their error; therefore, I must impose the penalty of £10, and award the sum of 40s. a day for four days. I see no reason, in such a case as this, where there is a monopoly, and where the public require and are entitled to—and pay a high price for—their water, why there should not be a full and efficient supply, and I see no reason why the full penalty mentioned in the Act—viz., £10—shall not be paid.

Mr. CLARKE applied for costs, but the Magistrate refused to grant them.

#### JONES V. THE SOUTHWARK AND VAUXHALL WATER COMPANY.

Mr. CLARKE, who appeared for the plaintiff, said that this was an exactly similar case to the one just decided, and he proposed to deal with it in the same way.

Mr. PARTRIDGE: I should suggest that in this case you should be satisfied with the payment of 2s. costs.

Mr. CLARKE: Plaintiff has been treated in the same way as Mr. Ladbury. He occupies premises at 4, Blackman Street. His payment for water used to be £1 10s. for the half year. It was raised at the last half year to £2 1s. for the half year, and a statement to that effect was served upon him. In consequence of communications which had previously taken place, he called upon Mr. Payne, and the charge was altered from £2 1s. to £1 18s. Plaintiff had offered the Inspector of the Company £1 18s., which was refused, and the water was cut off. On the day following that upon which the water was cut off, the plaintiff, along with Mr. Birt, went to the offices of the Company, and tendered the money, which was refused.

Mr. PARTRIDGE: I suppose in reality the Company have made a mistake, and I suppose what they would say is that the amount they charge is within the rate they are entitled to under their Act of Parliament.

Mr. M'COLL: That is what I was sent here to say.

Mr. PARTRIDGE: That would be a likely point for a test case. There is great doubt whether the Water Company are not, strictly speaking, right as to the amount demanded. What I mean to say is that it is not right these two cases should go off in this way, and that the public should get the impression that the Company are out of Court altogether as regards the legal question. The only point I, as a Magistrate, see here is—suppose the Company are right, are they wise in exercising their monopoly by putting in force the section of the Act of Parliament, and depriving the public of their water? Would it not be better to let the ratepayers have the supply, and then summon them, rather than cut off the water, which might prove prejudicial to the health of a district?

Mr. CLARKE: The difficulty we are in with regard to the matter is, that if we raise the legal question without tendering the money, our case might be seriously prejudiced with regard to the question of law.

Mr. PARTRIDGE: Why is it necessary to cut off the water? The Company have another remedy. These are not poor persons; they are worth

powder and shot. Why not summon them? I only throw this out as a suggestion to the learned counsel who represents the Water Company, because it seems to me that there is no reason whatever for cutting off the water supply. If the Water Company are damaged in any way, they can bring an action, and make it a test action. The Company are clothed with a monopoly, and, as I said before, water is as necessary to human life as air is. You have no business, as far as my view goes, to deprive the public of it.

Mr. M'COLL: I do not mean to justify the Company as a general rule; but I say there is much to justify them in the proceedings they have taken in the present case.

Mr. PARTRIDGE: The Legislature would not approve of any such course. I hope we shall not hear anything of the kind again.

Mr. CLARKE: I shall not insist upon the penalties in this second case, if the water is put on.

Mr. M'COLL: I will undertake that you have the water put on—at all events, if the Company take my suggestion, they will put it on.

Judgment was then formally entered for the nominal costs of 2s. against the Company in this case.

## Miscellaneous News.

### METROPOLIS WATER SUPPLY.

A LITTLE JOB DEFEATED.—At the meeting of the Metropolitan Board of Works on Friday last, a report was brought up from the Parliamentary Committee, recommending the confirmation of an agreement entered into by them with Mr. Way, of Denham, whose property would be interfered with by the works of the Board, in the event of the new Water Supply Bill passing. Mr. Freeman, who proposed the adoption of the report, said Mr. Way had petitioned against the Bill because of the interference with his property, which the carrying out of the scheme would involve; but if the Board agreed to the report, they would be relieved of any further opposition from this gentleman. Mr. Leslie and Mr. Watkins asked that the proposed agreement should be read; but, strange to say, this was objected to by Mr. Freeman. Mr. Fowler protested against the Board being pledged to unknown terms in order to buy up opposition; and Mr. Bevan said he thought the wiser course would be to withdraw both the Water Bills. The report of the Committee, on a division demanded by Mr. Leslie, was rejected.

BETHNAL GREEN VESTRY.—At the meeting on the 7th inst., a report was presented from a Committee, to whom the waterschemes of the Metropolitan Board had been referred. The report stated that, in view of the importance of the subject now before Parliament, more time was necessary for its consideration before any change was made in the present mode of supplying water; but that, meantime, they considered it to be undesirable to adopt the dual system, and if the Bills were proceeded with this session, the Vestry ought to take such action thereon as it might deem necessary. The report was adopted, Dr. Tidy assuring the Vestry that London was as healthy a city as any in the world, and the water better than was found in any other, and no diseases of any serious kind were demonstrably attributable to the water in use. The Clerk stated that the Vestries of the Metropolis were communicating with each other to oppose the New Works Bill, for none of them were in favour of the dual system. He thought they would see no more of that scheme.

HYDRANTS IN THE CITY OF LONDON.—An official inspection was made on the evening of Monday, the 11th inst., on behalf of the Metropolitan Board of Works, of the new hydrants recently laid down in the City. There were present Sir Joseph Bazalgette, Mr. Bramwell, C.E., Mr. Easton, and several other scientific gentlemen connected with the City. The experiments and tests made were of an exhaustive nature, and occupied some seven or eight hours. The results were very satisfactory. A large staff of the Fire Brigade were present with their hose vans, containing over 1000 feet of hose. The same tactics were pursued as would have been necessary had a large fire been raging, and was being dealt with in the entire absence of fire-engines.

METROPOLIS WATER SUPPLY BILL.—Signs are visible that the London Water Bill will not pass unopposed. So far as can be ascertained, ratepayers are by no means anxious to increase their responsibilities in favour of a scheme providing only a partial remedy for existing evils. Could a comprehensive plan be brought forward for the rescue of London from the Gas and Water Companies, there is little doubt that it would be received in a very different spirit, and that such sacrifices as it should render necessary would be cheerfully undergone. The present Bill bears on its face a tentative and makeshifty look, which effectually dispels any tendency to enthusiasm. Reduced to its lowest terms, it merely provides more effectually for the prevention of fires, and it remains to be considered whether the additional safety acquired by its adoption would not be purchased at an exorbitant rate.—*Iron.*

RATEPAYERS OPPOSITION TO THE METROPOLITAN BOARD SCHEMES.—On Monday evening, the 11th inst., a public meeting of the ratepayers of St. Pancras, convened by the Vestry, was held in the hall at Camden Town, for the purpose of protesting against the two Bills introduced by the Metropolitan Board of Works for the purchase of the existing Water Companies, and for introducing a new mode of supply. Sir Thomas Chambers, Q.C., M.P., the new Recorder of London, in opening the business, said the first, which was called the principal Bill, was for the purchase of the Companies. The second Bill was one which was to give the Metropolis a double supply of water. This would involve the breaking up of 2600 miles of roadways and footways, in order to lay down the necessary pipes. He looked upon this water question as one of the most grave and important matters that had ever come before the ratepayers of the Metropolis. The following resolution was adopted:—"That this meeting protests most strenuously against the proposal of the Metropolitan Board of Works to purchase the interests of the Metropolitan Water Companies, and to establish, at a large cost, a duplicate supply of water to the Metropolis."—On the same evening a large body of ratepayers assembled at the Lecture Hall, Carter Street, Walworth, for the purpose of "adopting measures to prevent the Metropolitan Board of Works expending upwards of £25,000,000 in carrying out the gigantic scheme for purchasing the Water Companies of London, compensating Officers and Shareholders, and providing a duplicate supply for watering streets and for drinking purposes." The chair was taken by Mr. George Hill, who said that they should ask the Government to delay the passing of this Bill for one session, until they could make more inquiry, and until the Metropolitan Board of Works furnished them with more evidence that the bargain would be a profitable one to the ratepayers of Newington. The resolutions opposing the purchase of the Water Companies of London were carried.—A meeting of a similar character was held in the Berners Street Hall, Islington, the same evening, to protest against the schemes of the Board.



The Registrar-General publishes the following returns of the average daily quantity of water supplied by the London Water Companies during the month of February, 1878. According to these, 117,265,890 gallons, or 532,793 cubic metres of water (equal to about as many *tuns* by measure, *tons* by weight) were supplied daily; or 216 gallons (98.1 decalitres), rather less than a *ton* by weight, to each house, and 30.5 gallons (13.9 decalitres) to each person, against 29.4 gallons during February, 1877.

COMPANIES.	Number of Houses, &c., supplied in		Aver. Daily Supply of Water in Gallons* during	
	Feb., 1877.	Feb., 1878.	Feb., 1877.	Feb., 1878.
Total supply . . . . .	530,656	541,779	110,670,713	117,265,890
From Thames . . . . .	218,196	254,964	55,996,723	58,506,255
„ Lea and other Sources . .	262,460	286,815	54,673,990	58,759,635
<b>THAMES.</b>				
Chelsea . . . . .	28,737	28,859	6,955,460	7,540,200
West Middlesex . . . . .	48,810	50,260	9,313,279	8,935,187
Southwark and Vauxhall . .	77,850	79,809	17,230,000	16,400,000
Grand Junction . . . . .	37,055	37,910	10,578,914	11,183,668
Lambeth . . . . .	55,744	58,126	11,919,100	12,447,200
<b>LEA AND OTHER SOURCES.</b>				
New River . . . . .	125,061	126,240	24,299,000	25,501,000
East London . . . . .	111,967	115,143	23,538,000	26,136,800
Kent . . . . .	45,432	45,432	6,536,390	7,121,835

\* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for February, 1878, as compared with that for the corresponding month of 1877, shows an increase of 11,123 houses, and of 6,595,777 gallons of water supplied daily.

Dr. Frankland reports as the result of his analyses of the waters supplied to the Metropolis and some of its suburbs during February, that, taking unity to represent the average amount of organic impurity in a given volume of the Kent Company's water during the nine years ending Dec., 1876, the proportional amount of such impurity in an equal volume of water supplied by each of the other Companies, and by the Tottenham Local Board of Health, was—Tottenham 0.7, Colne Valley 1.0, Kent 1.1, New River 2.2, East London 3.1, Southwark 3.2, West Middlesex 3.2, Lambeth 3.3, Chelsea 3.7, and Grand Junction 3.9. The water drawn from the Thames by the Chelsea, West Middlesex, Grand Junction, Southwark, and Lambeth Companies had improved in quality since his last report, though it still contained on an average 3.15 times as much organic matter as the Kent Company's water. All the Thames water was efficiently filtered before delivery. The water of the Lea was also of much better quality in February than in the two previous months. It contained on an average 2.41 times more organic matter than the Kent Company's water, although it was efficiently filtered before delivery. The water supplied by the Kent and Colne Valley Companies, and by the Tottenham Local Board, was clear, colourless, wholesome, and palatable, and of its usual excellent quality for dietetic purposes. Seen through a stratum 2 feet deep, the water supplied by the Kent and Colne Valley Companies, and by the Tottenham Local Board, was clear and colourless; the New River and East London Company's water was clear and almost colourless; and that distributed by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies, clear and very pale yellow.

#### Results of Analysis expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Mat- ters.	Or- ganic Car- bon.	Or- ganic Nitro- gen.	Am- monia.	Nitrogen, as Ni- trates and Nitrites.	Total combined Nitro- gen.	Chlo- rine.	Total Hard- ness.
<b>Inner Circle.</b>								
Thames—								
Chelsea . . . . .	30.81	.190	.031	0	.273	.394	1.6	21.2
West Middlesex . . . . .	31.18	.161	.030	0	.273	.303	1.65	22.1
Southwark and Vauxhall . .	31.14	.154	.033	0	.285	.318	1.65	22.2
Grand Junction . . . . .	31.40	.181	.050	0	.282	.332	1.6	22.2
Lambeth . . . . .	32.22	.169	.025	0	.304	.329	1.65	22.2
Other Sources—								
New River . . . . .	30.90	.108	.021	0	.353	.404	1.6	22.4
East London . . . . .	35.08	.154	.028	0	.346	.374	1.9	24.0
Kent . . . . .	41.32	.048	.016	0	.578	.594	2.5	28.1
<b>Outer Circle.</b>								
Colne Valley . . . . .	13.94	.047	.014	0	.339	.353	1.45	6.4
Tottenham Local Board . .	47.68	.031	.012	0	.584	.596	3.4	25.0
Corporation of Birming- ham* . . . . .	33.08	.081	.024	.002	.220	.260	1.4	17.4
Corporation of Glasgow† . .	2.8	.191	.013	0	.005	.018	0.50	1.11

\* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.  
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

LEFRACOMBE GAS COMPANY.—The annual meeting was held on Wednesday last—Mr. T. D. Wivell presiding. The Directors reported that on the transactions for 1877 there was a profit of £785 19s. 9d., out of which they recommended a dividend at the rate of 4 per cent., and also 3 per cent. for back interest on the A, B, and C shares (equal together to 7 per cent.). This would dispose of all arrears of dividend upon the shares in class C, leaving a small balance to be carried over to the current year. The Directors congratulated the Shareholders upon the improved position and prospects of the Company; and stated that since the last meeting they had secured, on advantageous terms, the piece of land adjoining their property and the main street, which would be of great benefit to the Company in many particulars.

BODMIN WATER-WORKS COMPANY.—The twenty-third half-yearly meeting was held on the 27th ult. The report of the Directors was the most favourable which the Company have made since their formation. After several years of uphill work, under most adverse circumstances, the number of services has, during the past few years, greatly increased; and they now show a profit during the half year of £80, which has been applied to the reduction of the adverse balance standing to the profit and loss account. The auxiliary steam-engine at Dunmere is now in an efficient state, but happily its services have seldom been required during the past half year; all the other plant and works of the Company are in good condition. The report of the Directors was unanimously received and adopted, and Mr. J. M. H. Cardell was elected Chairman of the Company in place of Commander Liddell, who retired in consequence of personal and family affliction.

#### HARROW DISTRICT GAS COMPANY.

The Half-Yearly Meeting of this Company was held at the Guildhall Tavern, London, on Wednesday, the 13th inst.—JAMES GLAISHER, Esq., F.R.S., in the chair.

The following report of the Directors was presented:—

The Directors, in again laying the accounts before the Shareholders, are enabled to report that there continues to be a steady progress in the position of the Company.

The gas-rental for the half year has increased £126 on the corresponding period of last year. The residual products have not produced so much as usual, the value being still low.

The balance of profit and loss account shows a total of £131 8s. 11d. for disposal. The Directors recommend that a dividend at the rate of 5½ per cent. per annum be paid, and that £216 9s. 6d. be written off the parliamentary expenses, which will leave a balance of £39 19s. 5d. to be carried to the credit of the next account.

Two Directors, Mr. James Glaisher, F.R.S., and Mr. John Chapman, and one Auditor, Mr. Fenton, retire by rotation, who, being eligible for re-election, offer themselves accordingly.

Revenue Account, for the Half Year ended Dec. 31, 1877.		£s.
Manufacture of gas—		
Coals, including all expenses	£1178 0 6	
Purifying materials, water, oil, &c.	35 17 3	
Salary of Engineer . . . . .	100 0 0	
Wages . . . . .	184 5 7	
Works, machines, and apparatus—maintenance of, repairs, and labour . . . . .	180 17 5	
Distribution of gas—		
Mains and service-pipes, repairs, maintenance, renewal, and labour . . . . .	54 5 8	
Meters, renewing, repairing, and refixing . . . . .	29 0 9	
Public lamps—		
Lighting . . . . .	22 2 0	
Rents, rates, and taxes—		
Rents . . . . .	22 9 4	
Rates and taxes . . . . .	168 2 8	
Management—		
Directors and Auditors allowances . . . . .	110 10 0	
Salary of Secretary . . . . .	25 0 0	
Collector's commission . . . . .	25 0 0	
Stationery and printing . . . . .	17 15 10	
General establishment charges . . . . .	73 18 9	
Sandries—		
Bad debts . . . . .	18 19 5	
Total expenditure . . . . .	£2186 5 2	
Balance carried to profit and loss account . . . . .	1246 11 1	
	£3432 13 8	
Sale of gas—		
Michaelmas quarter—		
Private rental—		
2,168,700 cubic feet at 6s. . . . .	£650 11 9	
236,500 cubic feet at 6s. 3d. . . . .	73 18 4	
Public rental and under contracts . . . . .	84 2 6	
Christmas quarter—		
Private rental—		
5,926,400 cubic feet at 6s. . . . .	1777 15 10	
680,400 cubic feet at 6s. 3d. . . . .	196 19 9	
Public rental and under contracts . . . . .	169 2 0	
Meter-rental, half year . . . . .	72 10 6	
Residual products—		
Coke, less labour and cartage . . . . .	312 14 5	
Tar . . . . .	63 2 8	
Liquor . . . . .	31 15 6	
	£3432 13 8	

The CHAIRMAN, in moving the adoption of the report, said although the Company had made some progress, and the rental for the half year had increased £126, still the progress was not very great. Harrow was a place without much go-aheadism in it, and he did not think that, commercially, it would ever show much more life than at present, unless from some external cause. On the other hand, the Company would doubtless keep all that they had attained, for there was a steadiness in the character of the place which was assuring in that respect. If it had not much commerce, it was not subject to the variations that commercial places were subject to. He did not know that he could add anything to the statements in the report, which, on the whole, he thought satisfactory. He had expressed strong hopes at the last meeting that this half year the Company would have paid 6 per cent., and so have redeemed the promise of the prospectus. Prudence, however, showed that the Directors had taken a right step in endeavouring to place the property on a solid foundation, by writing off the parliamentary expenses.

The DEPUTY-CHAIRMAN (Mr. John Chapman) seconded the resolution, and said that, although the Company's progress was slow, still it appeared certain. He was rather disposed to believe that Harrow was improving; for he found that all round the neighbourhood the houses were being rapidly taken up, more so than at any time since the establishment of the gas-works. He therefore looked forward to the prospect of the Directors soon being able to redeem their first anticipations.

The CHAIRMAN, in answer to a question, said the Local Board had increased the rating value from £240 to £1100. The Directors appealed against that assessment, and succeeded in reducing it to £700. The amount they had to pay for taxes had, therefore, been trebled. It was very sharp practice, but the Directors did all they possibly could. The Board had been obliged to raise money on loan for short periods, owing to their possessing very little working capital. It was likely that at the next meeting the Shareholders would be asked to sanction a small issue of the Shares at present unissued, so as to provide working capital. The subject of the loans had been well considered by the Board, and there was this to be remembered, that whatever capital they raised would carry 7 per cent. dividend, while they could borrow money at 5 per cent.

Mr. RANDALL thought that the Company were not progressing so rapidly as they should do, and regretted that the promise of the prospectus to pay 6 per cent. had not been yet fulfilled. He had hoped it would have been done this half year; coals had been cheap, and other Companies had increased their profits in a larger proportion.

Mr. BAYNES said the Board were acting the part of prudent men. They could, if they divided up to the hilt, have gone beyond any statement made in connection with the initiation of the Company. Mr. Randall would be the first to admit that it was wise to consolidate, and if they did not get the advantage in dividends they had it in the increased value of their stock. By writing off their parliamentary expenses they increased the value of their shares. He thought it was better to be satisfied with a fair dividend and improve the position of the Company all round, because that would be a much better thing permanently for the Stockholders. While the profits of the Company had considerably increased, the Board were exercising a policy of self-denial as to immediate benefits, and were looking to reap a full advantage in the future.

The resolution for the adoption of the report was carried.

On the motion of the CHAIRMAN, it was agreed—"That a dividend at the rate of 5 per cent. per annum be now declared and paid, and £216 9s. 6d. be written off the parliamentary expenses."

Mr. KILSBY moved, and Mr. BEADLE seconded, the re-election of Mr. Glaisher as a Director of the Company, which was agreed to.

Mr. RANDALL proposed the re-election of Mr. John Chapman, which was seconded and agreed to.

The CHAIRMAN, in responding on the part of himself and his colleagues, said no effort would be wanting on their parts to endeavour to realize everything mentioned in the prospectus. He hoped, in time to come, that they would be able to pay the full statutory dividend of 10 per cent. The Directors acted prudently at first, by paying a smaller dividend than possibly might have been paid if they had taken every farthing that they had earned, and he thought that this must lead in time to a much better dividend than the 6 per cent. which had been mentioned.



On the motion of the CHAIRMAN, Mr. Fenton was re-elected to the position of Auditor.

Mr. FENTON said it amounted almost to a pleasure to audit the books, they were kept in such prime order, and he hoped he should continue to enjoy that pleasure for some time to come.

The CHAIRMAN proposed a vote of thanks to their Engineer, to whom they were deeply indebted for his constant attention to his duties.

Mr. BAYNES seconded the motion, and referred to the manner in which the Company's finances were dealt with, which he considered very satisfactory. By means of temporary loans they saved considerable sums for interest, and avoided saddling the Company with a permanent charge. It had been the anxiety of the Board so to manage that part of the business as to receive the just amount of profit for the Shareholders. With regard to their Engineer, his devotion to the Company was everything they could wish, and, personally, he was very glad to see him in much better health than unfortunately he had lately enjoyed.

The resolution was unanimously adopted.

The ENGINEER (Mr. James L. Chapman) said he was very much obliged for the observations that had been made, and the vote which had been passed. It was always his interest to do the best he could for the Shareholders, and to apply all the information he had the opportunity of acquiring for the benefit of the Company. As Secretary of the Southern District Association of Gas Engineers, he had a good opportunity of learning everything taking place in that direction, and would always use his knowledge for the interest of the Harrow Gas Company.

A vote of thanks to the Chairman brought the proceedings to a close.

#### HASTINGS AND ST. LEONARDS GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Thursday, the 7th inst.—Mr. GEORGE SCRIVENS in the chair.

The SECRETARY (Mr. W. B. Young) read the notice convening the meeting, and the following report was presented:—

Your Directors have the pleasure of meeting you on this occasion in the new Board-room, and have to report that the offices below the Board-room will be opened for public business in a few days.

The whole of the material for the new lift to the large gasholder was to be shipped on the 28th ult., and it is expected to be on the Company's premises during the present month, when the work will be commenced forthwith.

The general rise in the labour market has had considerable effect on the expenses of manufacture, and consequently tells on the finances of the Company.

The accounts, duly audited, are presented in the balance-sheet; and although not so favourable as those presented on other occasions, still leave a balance in favour of the Company of £3875 14s. 10d.; and it is proposed to pay a dividend of 10 per cent. per annum on the £25 paid-up shares; a dividend at the rate of 7 per cent. per annum on the paid-up £20 shares; and interest at the rate of 7 per cent. per annum on the new £12 paid shares; amounting together to £3537 10s., which will leave a balance on the current half year of £538 4s. 10d. to be carried forward to the next account, together with the sum of £537 4s. 10d. brought forward from the last half year.

A contract has been agreed upon with the Town Council for lighting the public lamps at the reduced rate of £4 5s. 6d. per lamp, for five years, commencing from the 1st of January last.

Dr.	Working Account, for the Half Year ending Dec. 31, 1877.	Cr.
Stock, as per inventory, July 1, 1877.	£18,802 0 4	Private gas-rentals . . . £13,817 6 3
Coal . . . . .	3,624 3 0	Public ditto . . . 1,829 14 10
Freight, railway, carriage, cartage to works, and trimming . . . . .	3,237 14 6	Coke and other residual products . . . . . 3,482 17 8
Coal duty paid to Hastings Urban Sanitary Authority. Salaries and wages . . . . .	763 14 1	Fittings . . . . . 327 4 8
Salaries remuneration . . . . .	150 0 0	Rents . . . . . 50 14 11
Auditors ditto . . . . .	15 15 0	Stock in hand . . . . . 7,807 10 0
Salaries, including Clerks and Collectors . . . . .	632 6 0	Meters on hire and in stock . . . . . 5,232 13 6
Wages . . . . .	3,240 18 11	Coal, ashes, &c. . . . . 297 10 8
Bad debts and overcharges . . . . .	122 6 2	Three steam-engines, &c. . . . . 248 17 1
Income-tax & sundry charges . . . . .	470 16 4	Retorts at work and in stock . . . . . 1,558 3 10
Rents . . . . .	30 0 0	Sundries . . . . . 3,418 5 3
Stock purchased . . . . .	1,789 5 5	
Tradesmen's accounts . . . . .	762 11 10	
Interest on debentures . . . . .	524 12 3	
Balance . . . . .	3,875 14 10	
	£38,100 18 8	£38,100 18 8
Balance brought down . . . . .	£3,875 14 10	
Balance brought forward from last half year . . . . .	537 4 11	
	£4,412 19 0	

On the motion of the CHAIRMAN, seconded by Mr. J. H. COOK, the report and accounts were adopted without discussion.

Mr. WALDER said with regard to the report, so far as the figures were concerned it seemed satisfactory; but he hoped to have heard some promise that there might be, in a short time, a reduction in price to gas consumers. He thought it was no use shutting their eyes to what was taking place out of doors. If they could not make a reduction in the price, he thought the Directors should let the outside public know the reasons, because, no doubt, there were reasons.

The SECRETARY stated that a letter had been received from Mr. F. B. ELLIOTT, on behalf of the Gas Consumers Committee, asking for a conference with the Directors, and they had granted the request.

Mr. WALDER was very pleased to hear this. He thought it was possible that the Directors could give good reasons why the price could not be reduced. He then referred to the reasons given by the Manager (Mr. A. H. WOOD) at the last meeting of the Shareholders, why they could not reduce the price, and said he was afraid that the present agitation arose out of it. He thought the best course was to let the public know something more.

Mr. BROWN (a member of the Town Council) said that before he came to the meeting he decided not to enter into the question of the agitation, and he thought the other Directors felt the same. Perhaps some explanation was due on their part, not on account of outside agitators, who could take their own course, but to those Shareholders who were not so well informed on the matter as the Directors were. He objected to the constant use of the words "gas monopoly," because he considered there was no monopoly: it was a fair bargain made between two parties—the Company and the Consumers—and sanctioned by Act of Parliament. The question arose, "What is monopoly?" Well, he had Mr. ELLIOTT's definition of what was a monopoly, and he could agree with him on that point, although he differed from him on many others. Mr. ELLIOTT said that the monopoly was that the Company charged what they liked, and the people had to pay it. On that ground he contended that theirs was not a monopoly because they were bound not to charge more than a certain sum, and not to get more than a certain profit. Persistent statements were continually being made about the back dividends paid by the Company, and answers had frequently been given at their meetings. He said that the people ought to know better; the interest paid by the Company amounted to just 7½ per cent. on the whole capital. As to the bonuses, why the Company did not pay bonuses at all; the law would not allow them to do so; so they could only pay their legal dividend.

The SECRETARY here read a portion of the Company's Act of Parliament,

showing that the profits to be divided amongst the Shareholders shall not exceed 10 per cent., and that the excess, if any, shall from time to time be invested in Government securities, to meet any deficiencies that may arise on any extraordinary claim or demand. He added that the profits of the Company had never been sufficient to form a reserve-fund.

Mr. BROWN (in continuing) illustrated the subject of back dividends by saying that, suppose he employed a man at 30s. per week, and at the end of the first week he could only pay him £1, but paid him £2 the following week, the man would not consider the 10s. a bonus, or that his wages were £2 per week, because the 10s. was owing to him. That was just the way with their back dividends—it was money owing to them. He pointed out that it was impossible that their dividends could keep a dead level, for they must increase their works as the consumption increased, and, consequently, a large amount of capital lay dead for a time. When they were obliged to expend more capital, the dividends went down, and afterwards they would gradually go up. But then it was asked why they could not supply gas at the same rate as in other towns. His answer was that the price of the gas must depend on the cost of the coal. It was all very well to pick out two or three towns where coals could be got much cheaper than at Hastings. A fairer way would be to take the towns in the neighbourhood—towns of the same size—and compare Hastings with them. He had a list of the prices paid in 30 towns, which might be considered a very fair selection. Sixteen of the towns paid more for gas than Hastings, and 14 less. The cost of coal in 26 was cheaper, and in four dearer, than Hastings. The average price of gas to these 30 towns was 4s. 4d. and a fraction per 1000, and in Hastings the price was 4s. 5d. The average cost per 1000 for the public lamps in these towns was 4s. 1d. and a fraction. He thought the price they should charge the consumers should be regulated by the dividend; the dividend should be paid first, and the price of the gas regulated afterwards. With reference to the charges that the Company's capital was more than they required, it must be remembered that, as their trade increased, they had to increase their works. In 1858 they made about 28 million feet of gas, and last year it amounted to 150 million. Therefore, according to some people's doctrine, they should have had the works for making 150 million feet of gas when they only required 28 million. The Directors must look to the interests of the Shareholders, without taking notice of outdoor agitators. He had been told that he would lose his seat in the Council for the part he took in the interest of the Gas Company. All he could say was, so much the worse for the Council. He could do without the Council; and so long as he retained a seat on that Board, he would feel bound to do his best for the interest of the Company.

The CHAIRMAN said that, though the breeze of public utterance was against the Company, the Directors had done nothing to deserve it; and after Mr. BROWN's speech, he hoped the public would feel that the other side had put a case which was too strongly coloured.

A vote of thanks to the Chairman, moved by Mr. ELKIN, and seconded by Mr. PICKNELL, concluded the proceedings.

#### BRISTOL UNITED GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held on Wednesday, the 13th inst.—Mr. F. TERRELL in the chair.

The SECRETARY (Mr. H. H. TOWNSEND) read the notice convening the meeting, and the following report of the Directors was taken as read:—

The statement of the accounts of the Company for the half year ended the 31st of December last is herewith forwarded to each Proprietor, and, as may be seen by a comparison with the corresponding half year of 1876, in one particular only shows any important variation calling for special remark, and that is in the amount of balance carried to profit and loss account. The profit shown in the present account is less than in the corresponding half of 1876, but this is explained by the fact that during the year 1877 a reduction of 6d. per 1000 feet has been made in the selling price of gas, and also a reduction in the charge for the public lamps.

The Engineer reports that the works of the Company are in a sound and efficient condition.

The plans for the erection of new works on the land at Stapleton are now nearly ready, and it is expected that the buildings will be commenced during the ensuing summer.

The Directors recommend that a dividend at the rate of 10 per cent. per annum on the capital of the Company entitled to dividend be declared, and made payable at the bank of Messrs. Miles, Cave, Baillie, and Co., Bristol, on and after Monday, the 25th day of March inst., subject to the deduction of income-tax.

The CHAIRMAN, in moving the adoption of the report and accounts, said there was nothing, as the report stated, that called for special remark, except in one particular. He had no doubt it had been noticed by every Shareholder that the profit shown was less than in the corresponding half of 1876. The report explained this by stating that a reduction of 6d. per 1000 feet had been made on the selling price of gas to private consumers, and there had also been a reduction in the charge for the public lamps. This would fully account for the variation that was spoken of in the balance carried to profit and loss. Their Engineer reported that the works of the Company were in a sound and efficient condition, and that the plans for the erection of new works on the land at Stapleton were now nearly ready. The Engineer had given a great deal of time and attention to the works which he (the Chairman) hoped would soon be in course of erection at Stapleton. When they were finished he had no doubt that they would derive a corresponding profit from them. The report, although it was very short, spoke plainly, and he thought it clearly showed the state of the accounts and the condition of the works. He hoped the Shareholders were so satisfied of this that it would require no further observations from him to recommend the adoption of the report.

Mr. T. T. TAYLOR seconded the motion, remarking that the balance-sheet, and everything connected with it, showed that the Company were going on in a fair and prosperous way. They must all have seen from time to time, in the reports of the Town Council proceedings, that the manufacture of their gas had been very satisfactory, both as regarded quality and illuminating power, and that it had been free from ammonia and everything that was noxious. Their works were in a most efficient state, and their new works were almost ready. The works had been most ably designed by their Engineer. The very highest engineering opinion in the country had been obtained in order to satisfy the Directors that the plan proposed by their Engineer was a thoroughly good and efficient one, and it was very satisfactory to know that his suggestions had been entirely approved of, and that the new works would be carried out in the way he proposed.

Mr. R. W. GILES, after criticizing one or two features in the accounts, said he thought there was a substantial grievance under which the Shareholders laboured. He wanted to know why the dividends could not be distributed in something like reasonable time. Great Railway Companies managed to close their accounts and distribute their dividends in five weeks, whereas this relatively small Company required three months to do so. No doubt it had been the routine of the Company but if challenged and objected to it might be altered. The Shareholders would like to have the dividends in their pockets at the earliest opportunity. Then, again, was it altogether *ultra vires* to declare the dividend free of income-tax? He did not know why their dividend should be charged income-tax, for it was not so with some other Gas Companies with whom he was connected. He did not ask these questions in a spirit of opposition, for the Share-



holders could not give the Directors too much credit for the care they had taken in administering the affairs of the Company.

The CHAIRMAN said they had had legal advice as regarded paying their dividends free of income-tax, and their legal adviser told them that they had better not do it.

The SECRETARY said gentlemen out of doors did not know the difficulties that existed in making up the accounts of the Company. He could say as a fact that there were very few Gas Companies in the country who paid their dividends under three months. The Company had an immense number of registers of meters to take, and they could not be commenced until a day or two before the end of the half year. It took the best part of four or five weeks to get the whole of those registers taken, then they had to be entered in the books, and the rental made up, so that it was a considerable time before the books could be balanced. It had been the practice of the Company during all the years he had had the honour to be Secretary—now 40 years—that the dividends should be paid on the 25th of March and the 29th of September every year. He should say, so long as the Shareholders obtained their dividends at two stated periods of the year, it did not much matter whether it was one month earlier or later. To make up the accounts in less than three months would involve a very great increase in the staff, and there would be considerable difficulties. As regarded the income-tax, they were precluded by Act of Parliament from paying a penny more than 10 per cent.

The AUDITOR (Mr. W. Tripe) said the Shareholders could have very little idea of the amount of work involved in making up the accounts. There were an immense number of accounts in the city, and none of them could be entered until the meters were examined and the results obtained. He knew that, as regarded the audit, they had very hard work to complete it within the time, although they commenced immediately after the meter-taking was finished.

The motion for the adoption of the report was then put and carried unanimously, and the dividend mentioned in the report declared.

On the motion of Mr. R. W. GILES, a vote of thanks was passed to the Chairman and the Directors.

The CHAIRMAN briefly acknowledged the compliment paid the Board, and the meeting terminated.

## IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The general condition of trade has been rather better and more hopeful during the week, but the unsettled state of politics still prevents matters from assuming that development which would appear to be probable immediately the Eastern Question has been definitively disposed of. At the same time it must be recorded that there are many more inquiries in the market now than there were a few weeks ago, and in two or three branches of the leading local industries, there is already more work in course of execution. In pig iron this feeling is tolerably well marked, so far as all the leading Yorkshire and Derbyshire brands are in question, but the commoner qualities are still a good deal neglected, and stocks of considerable size must of necessity be cleared off before the smelters will be able to insist upon any advance in their prices. The action of the Cleveland smelters, to which I made allusion last week, has hardly had the effect which was anticipated, since it is seen that the stock on hand in that district is so exceedingly large.

In the finished iron branches the amount of current business is not large, and few of the concerns devoted to it are at all busy. Some of them, in fact—Messrs. Appleby and Co., of Renishaw, for instance—have reduced the wages of their workmen during the week by 5 per cent., and in other cases short time still obtains. The working engineers are also having their wages lowered 2s. weekly, but they have organized a determined opposition to the proposal. At present they receive 34s. weekly, but the new rate is fixed at 32s., and all the men who decline it are being dismissed.

It may interest many of the readers of this JOURNAL to know that Siemens-Martin steel is coming into very extensive use in many directions, and is found to be a most efficient, cheap, and reliable substitute for many ordinary kinds of cast steel.

The coal market is quiet, and prices have a downward tendency in all directions. The proposed reduction of 7½ per cent. from the miners wages is causing much discussion amongst the men; but there is no reason for supposing them to be in a position to offer any organized resistance to the proposal.

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Trade in this district is without improvement from last week, and there is a gradual downward tendency in the value both of coal and iron, the question with many sellers being more one of securing orders than one of prices, the consequence being that there is a great deal of underselling going on in the market, and those firms who hold for late rates find it very difficult to secure business of any kind.

The demand for all classes of round coal is now but very limited, and preparations are being made for putting many of the pits on short time during the coming summer months, as colliery proprietors see that with trade in its present condition it will be impossible to get rid of anything like their average production. For the better classes of round coal, which, during the winter months, have been proportionately higher than other descriptions of fuel, prices are now easier, and good screened Wigan Arley can be bought for less than 9s. per ton, and the inferior sorts for less than 8s. per ton, whilst good Pemberton four-feet can be bought as low as 7s. 6d. per ton at the pit for anything like sales in bulk. Second qualities of coal, which all along have been very low in price, show no material change, but they are still a great drug in the market. Common coal at the pit mouth is quoted at from 5s. 6d. to 6s. 6d., according to quality; good ordinary burgy at from 4s. 6d. to 5s.; whilst slack can be bought at any price from 2s. per ton and upwards.

There is still little or nothing doing in the shipping trade, and the various ports are overstocked with coal. For common coal delivered at the High Level, Liverpool, it is difficult to obtain more than from 6s. 6d. to 6s. 9d. per ton.

In the iron trade local producers both of raw and finished iron are undersold by the makers of outside brands, and the business doing is very small. North country pig iron and bars are now being pushed in this district at lower figures than ever; but the low prices do not stimulate fresh business. The average quotations for delivery into the Manchester district are about as under:—Lancashire pig iron, No. 3 foundry, 51s.; No. 4 forge, 50s. per ton, less 2½ per cent.; Middlesbrough, No. 3 foundry, 48s. 3d. to 48s. 9d.; No. 4 forge, 47s. 3d. to 47s. 9d. per ton net cash; Lancashire bars, £6 2s. 6d.; Middlesbrough, £6; and North Staffordshire, £6 7s. 6d. per ton.

All the works throughout the district are short of orders, and numbers of men are constantly being discharged.

The men employed at the finished iron works have resolved to resist the proposed further reduction of 2½ per cent. in wages next month.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The shipments of coals from the Durham mining district continues to have a tendency to fall away; they have been several thousands of tons less within the past fortnight than during the previous fortnight. The decrease is in house and the second-class coals. As a considerable quantity of the best gas coals is contracted for over the year, there is not an excess of that in the open market. Prices are pretty steady for best gas coals at 7s. 6d. per ton. There is very much less inquiry for second-class gas coals, and there is a difficulty experienced in upholding current rates. House coals are just a little weaker in price, with few orders in the market. The Northumberland steam collieries are working steadily, though not on full time. Prices have fallen a little, and coal fitters are disposed to accept a slight reduction from present rates. A few more contracts for steam coals are being made for the Baltic and North of Europe, but at a low figure.

The freight market is still in a depressed state. Coasting business shows no improvement. London rates are 4s. 3d. steamers, and from 5s. 3d. to 5s. 4½d. sailing ships; the latter to discharge coals at the wharves below bridge. Steamers are engaged to load coals for Rochester at 4s. 3d.; Havre, 5s. 6d.; Dieppe, 5s. 6d. per ton; Hamburg, £5 5s. to £5 10s. per keel. Baltic business is opening slowly, and outward rates for the lower ports do not show any improvement. Probably from the fact that home-ward business is slack from the Black Sea, a trifle more money has had to be paid to steamers and sailing vessels to load steam and gas coals for the Italian and other ports of the Mediterranean. So far as can be seen at present, freights are likely to continue very moderate for the first half of 1878, and business generally in this particular will favour the shippers.

There is a good deal of discussion going on with regard to German coals. The Germans, like the coalowners in this country, during the time of inflated prices, put a great deal more capital into their collieries than they find, when trade has got to its present state, they can make a profit upon. Of course, there are obligations to meet, and they compete pretty keenly with our coalowners for trade in the Baltic and the North of Europe generally; but so long as we can send coals by steamers at about £5 5s. per keel to Copenhagen, Swinemunde, Fairwater, and other ports, and deliver the coals free on board ship at the present rates, merchants here are pretty sanguine that they will run the Germans out. In fact, freight on sea-borne coal, as against land carriage, is now a very important matter in the entire coal trade of the world. So long as North country coal can be delivered at the figures quoted above, they have a considerable advantage over other coals which have to be carried 200 or 300 miles by railway at fixed charges.

The iron trade of Middlesbrough is going on about the ordinary rate. More steel rails, however, are being made, and the Tees is likely to establish a position in this branch of trade. There have been considerable shipments of pig iron to the Continent. The market, generally speaking, for manufactured iron is dull. Common bars are sold at £6 5s.; merchants bars, £9 per ton; rails, £6 5s. per ton; pig iron, local make, No. 1, 45s.; No. 3, 41s., net cash.

The chemical market was more animated last week. The prices, especially for soda, are higher, and some sorts of chemicals are a little scarce. Pig lead is selling at £20 6s. per ton; dry white lead, £24; red lead, £19; flake litharge, £20 10s.; copper flat cake and ingot, £74 to £75; best selected, £76 to £77 per ton.

## TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

At a meeting of the Directors of the Denny Gas Consumers Company, held last Tuesday, it was agreed to reduce the price of gas 5d. per 1000 cubic feet, the reduced rate being 6s. 8d.

The Police Commissioners of Kirkintilloch held a meeting on Monday, the 11th inst., in their capacity of Commissioners under the Burghs Gas Supply (Scotland) Act, 1876, when the Clerk reported that, according to instructions given him at the preceding meeting, he had served upon the Kirkintilloch Gas Company a formal notice in terms of the statute intimating the willingness of the Commissioners to treat for the purchase of the undertaking of the Company. Ex-Provost Downie gave notice that at the next meeting he would move for the appointment of a Committee to consider as to proceedings for the acquisition of the works.

Newport, the Fifeshire suburb of Dundee, has recently had its street lighting very greatly improved, through the efforts of a Committee appointed to raise a fund by voluntary subscription for the purpose of erecting a number of new lamps in the village. It has just been reported to the Directors of the Newport Gas Company that 35 new lamps have been placed, and that all the old lamps have been put in thorough repair. The fund raised was more than sufficient for the purpose. In consequence of this movement the lighting of the village has been practically doubled. The improvement is obvious, not only in Newport, but also from the north or Dundee side of the Tay, the lines of light on the south side being now visibly extended.

It was resolved, at the last meeting of the Town Council of Dumbarton, to limit the powers of the Gas Committee to this extent—namely, that they should only have power to arrange for, and carry on, the business of the manufacture of gas and its residual products; all proposed repairs, alterations, or extensions of the works to be submitted to the whole Corporation; and that they should not enter into contracts for more than one year's supply of coal at a time, without consulting the Commissioners as a body.

Dr. Wallace's report on the illuminating power of the Glasgow gas for the week ending the 9th of March, shows that in the western or Partick district the minimum was, on one occasion, as low as 24.60 candles, or half a candle lower than the standard fixed by the local Gas Act. In no other instance was it under 25.67 candles; while in the northern district, which is supplied from the Dawsholm works, the lowest minimum was 26.20 candles. The maximum ranged from 26.02 candles up to 28.29 candles, and the average from 25.85 candles to 26.61 candles.

The subject of the proposed water supply for Arbroath, from Crombie reservoir, was considered at a meeting of delegates held last Tuesday, when it was resolved to oppose the scheme. A committee were appointed to watch over the matter, and a resolution was passed requesting the Commissioners of Police to adopt the necessary measures for securing the purity of the present water supply.

At Lochgelly, the centre of an important mining district in Fifeshire, a Court was held, on Monday, the 11th inst., by Sheriff Bell, for the purpose of receiving evidence relative to the introduction of a water supply from Lochernie. The evidence showed that a supply was urgently required. The cost of the proposed works was estimated at £6800, and it was stated that the supply would be 120,000 gallons per day, which would give 20 gallons to each inhabitant. The water was said to have a yellowish tinge, but that Lochernie was the only available source; and Dr. Stevenson Macadam reported that it was quite suitable for domestic purposes. Opposition was given to the scheme, but it was not supported by any evidence. The Sheriff thought the colour



of the water a somewhat serious objection, and intimated that he would report the state of matters to the Secretary of State.

The *plébiscite* on the water supply question at Rothesay has gone against the proposal to purchase the works of the Rothesay Water Company for the sum of £25,000. There were 1718 voting cards issued, of which 850 were returned, and of which 20 were blank or neutral, 24 spoiled, 342 for the purchase, and 419 against. It is now thought to be probable that a new scheme of water supply will be matured and carried, a very liberal offer in that direction having been made by the Marquis of Bute to the Town Council of Rothesay. At the last meeting of that body, which was held on Monday, the 11th inst., a very valuable report on the subject was submitted from Mr. George Cunningham, C.E., Edinburgh. In the meantime the whole question has been remitted to a Special Committee for consideration and to report.

Considerable progress has recently been made with the new water-works for Dunfermline. All the pipes have been laid to Craigluscar, and that part of the track has lately been subjected to very severe tests, which it has borne very well, there being comparatively few bursts in the pipes.

The Glasgow pig iron market has been very steady during the past week, and a good business has been done in warrants at 51s. 4d. to 51s. 5½d. cash, and at 51s. 6d. one month, the market closing on Friday with buyers at 51s. 4½d. cash.

There is still considerable dulness in the coal trade. Prices have touched a very low level, in some instances not paying the expenses of raising the coal.

Mr. W. Key, Glasgow, writes complaining of the reference to him last week in our "Trade Notes from Scotland." He wishes it to be understood that he has no communication with, and has never given any information to, our Correspondent, relative to the affairs of the Glasgow Corporation Gas-Works. We readily give insertion to this disavowal, the more so that our Correspondent expressly stated that his information was derived from "an outsider."

**BISHOP AUCKLAND DISTRICT GAS COMPANY.**—At a meeting of this Company, on the 22nd ult., it was resolved to increase the capital to £20,000.

**THORNHURST GAS COMPANY.**—At the half-yearly meeting of this Company, on the 26th ult., a dividend at the rate of 5 per cent. per annum was declared.

**CONSETT WATER COMPANY.**—At the half-yearly meeting, on the 22nd ult., a dividend of 4½ per cent. was declared on the original shares, and of 5 per cent. on the new capital.

**COLWYN GAS AND WATER COMPANY.**—This Company was registered on the 18th ult., with a capital of £10,000, in 1000 shares of £10 each. The object of the Company is to manufacture gas, and to supply gas, coke, and water to the inhabitants of Colwyn and vicinity, in the county of Denbigh.

**LONGBRIDGE GAS COMPANY.**—At the meeting of this Company, on the 16th ult., a dividend of 5 per cent. was declared, and in view of a necessary increase in gasholder room, the Directors were empowered to issue new shares, not exceeding £3000 in amount, preference of allotment being given to existing Shareholders.

**EXPLOSION AT THE WORKINGTON WATER-WORKS.**—On Monday, the 11th inst., a serious boiler explosion occurred in the engine-house of the Workington Water-Works, by which the inhabitants of the town will be deprived of their supply. The works were inadequate for the district, and the Workington Local Board have a Bill in the present session of Parliament for power to supply the district from Crummock Lake.

**DERBY GAS COMPANY.**—The half-yearly meeting was held on the 28th ult.—Mr. George Gascoyne in the chair—when the usual dividend of 10 per cent. on the original shares, and 7 per cent. on the new shares, was declared. The retiring Directors—Messrs. Gascoyne, Peat, and Owen—were re-elected, and also Mr. Basford, the retiring Auditor. The Chairman, in congratulating the Shareholders on the soundness of the Company, remarked that they were supplying gas at as low, if not lower, rate than almost any other Company in the kingdom.

**BAGSHOT GAS SUPPLY.**—The Bagshot Gas and Coke Company, Limited, incorporated in May, 1864, have just been wound up voluntarily, by a special resolution of the Shareholders, and the works of the Company, together with the main-pipes, and rights, have been sold to Mr. R. Kemp (late of the City of Moscow Gas Company), who for some time has held a lease of the works. Bagshot, which is one of the healthiest spots in the kingdom, is rapidly improving by the erection of a mansion for the residence of the Duke of Connaught, and by the introduction of a railway station in connection with the South-Western system.

**REDUCTIONS IN THE PRICE OF GAS.**—The Directors of the Crystal Palace District Gas Company, in their half-yearly report just issued, announce a reduction in price from 4s. to 3s. 10d. at Lady-day. The two Companies supplying Woolwich—the Woolwich Equitable Gas Company and the Woolwich, Plumstead, and Charlton Consumers Gas Company—announce that on and after the 1st day of April next, the charge for gas will be reduced from 8s. 9d. to 3s. 6d. per 1000 feet. The Corporation of Stockport have decided that, from the 31st of March, the price of gas supplied from their works shall be as follows:—Inside the borough, from 100 feet to 500,000 feet, 3s. 6d. per 1000 feet; from 500,000 feet and upwards, 3s. 5d.; outside the borough, from 100 feet to 500,000 feet, 4s. 2d.; from 500,000 feet to 1,000,000 feet, 3s. 11d.; from 1,000,000 feet and upwards, 3s. 10d. At the last meeting of the Farnfield Gas Company it was resolved to reduce the price from 7s. to 5s. per 1000 feet.

**SPENNYMOOR GAS COMPANY.**—The half-yearly meeting was held on the 13th ult., when the report of the Directors was submitted and adopted. It showed that £337 18s. 8d. had been expended in building a boundary wall round the works, and covering the brook and enclosing the new ground; £525 8s. 10d. for new mains, service-pipes, and other work connected with distribution in the new district; £58 13s. 2d. for new meters—making a total sum expended during the year of £917 0s. 8d. The profit and loss account showed an available balance of £738 6s., after deducting £45 interest on loan account, £905 15s. 11d. interim dividend for half year ending June 30, 1877, £23 16s. 7d. interest on prepaid calls, and £6 18s. 8d. for bad debts; out of which they recommended the payment of a dividend, clear of income-tax, at the rate of 4 per cent. on the capital, and 2½ per cent. on the additional capital. This, with the interim dividend of 3½ per cent. on the original, and 2 per cent. on the additional capital, would make a total dividend for the year of 7½ per cent. on the original capital, and 4½ per cent. on the additional capital.

**GAS-METER TESTING AT NEWPORT.**—At the meeting of the Newport (Isle of Wight) Town Council on the 26th ult., a letter was read from Mr. A. H. Estcourt, Secretary to the Newport Gas Company, respecting the result of the testing of four meters belonging to the Corporation, and fixed to the public lamps. It appeared that the average was 8 per cent. slow, or against the Company, and the Directors called the attention of the Council to this unsatisfactory state of things, which they believed to be in consequence of the meters of the Corporation being dry ones of an inferior

description, and not to be relied on. The Directors expressed their willingness to incur the expense of replacing these meters by new wet meters, which they believed would register more accurately. In reply to a question, the Surveyor said the first meter referred to by the Secretary of the Company registered 5300, and was 10 per cent. slow; the second 4400, and was also 10 per cent. slow; the third, 4400, and was 5 per cent. slow; and the fourth, 4700, and was 7 per cent. slow. A wet meter at Shide Cross registered 4100, and was 3½ per cent. slow. It was suggested that four of the lowest should be tested, and the Surveyor received instructions accordingly.

**NEATH WATER COMPANY.**—The half-yearly meeting was held on the 27th ult.—Mr. T. White in the chair. The report stated that the dividend on the Neath undertaking would be 10 per cent. during the half year. Upwards of 70 new services had been laid on, but the income had been lessened by the continued depression of trade, which had caused a falling off in the receipts for the supply of water by meter for manufacturing purposes. The Briton Ferry Local Board had at length taken steps for carrying out a system of drainage for the town, and the Directors had made the necessary arrangements for meeting all the sanitary requirements. Arrangements had been made by which it was hoped the Company would be able to supply the rapidly increasing district of Skewen in the summer. In order to carry out these works, the Directors proposed to raise £3000 additional capital, by 5 per cent. preference shares of £10 each. The Chairman, in moving the adoption of the report, referred to the depression of trade which had existed in the district, and to the fact of the Great Western Company having built large works at Neath, where 1000 operatives would be employed, and this would increase the amount of water to be supplied. Briton Ferry requirements would also largely increase. The report and accounts were adopted.

**SOUTH ESSEX WATER-WORKS COMPANY.**—A meeting of this Company was held last Wednesday—Mr. W. C. Fooks in the chair—when the Directors reported that the balance of the profit and loss was sufficient for the payment of a dividend at the rate of 5 per cent. per annum. The £2700 authorized in August last to be borrowed had been raised by the issue of mortgage debentures of £100 each, for seven years from the 25th of December, 1877, bearing interest at the rate of 4½ per cent. per annum. The additional pumps and other works were also nearly completed. Arrangements were in progress for the construction and laying down, at an expense of about £300, of a tramway to connect the Company's works with the Gray's Chalk Quarries Company's Tramway, by the use of which a considerable saving in the cost of carriage and coals and goods to the Company's works was expected. It had been proposed by the Billericay Union Rural Sanitary Authority to supply the Company with water for the purposes of the district at a minimum rental of £100 per annum, which proposal had been entertained, and was in course of being matured into a binding contract. The Directors estimated that at least £4000 would be required to place the Company in a position for taking over and resuming the management, and in view of this requirement the Directors recommended the authorization of a further exercise of the borrowing powers.

**MAIDSTONE WATER-WORKS COMPANY.**—The annual meeting was held on the 28th ult.—Mr. John Monckton in the chair. The report of the Directors stated that the water-rents for the first three quarters of last year amounted £1138 9s. 8d., £1124 5s. 1d., and £1173 9s. 4d. respectively, while those for the last quarter were estimated to produce about £1160, making a total for the year of about £4596. Taking into account the amount due from customers on the trade account and the value of coal, &c., on hand, the Directors estimated that there was a profit for the year of about £1237, without, however, taking the special and extraordinary repairs into account. This being a clear income of more than 6 per cent. upon the ordinary share capital, the Directors thought the Shareholders were to be congratulated. During the year both the boilers at the works had undergone a thorough repair at a cost of £399 7s. 5d. An unfortunate accident occurred in November, by which the pipe through which the water from both the engines passed to the reservoir was broken, and this had led to repairs which had cost £141 5s. 11d., while the water supply to the town was stopped for a week. The Directors regretted that they were prevented, owing to the large outlay on these extraordinary repairs, from recommending any larger dividend than one of 4 per cent. per annum, free from income-tax, to be payable on the 1st of May. The Directors having paid for the repairs of the boilers (£399 7s. 5d.) out of the profits of the year, the remaining profits would not allow a higher dividend. The other extraordinary repairs (£141 5s. 11d.) the Directors recommended should be paid out of the reserve-fund, which now amounts to £174 0s. 2d. The proposed dividend would absorb £800 of the profits of the year, and after deducting also from such profits the £399 7s. 5d. paid for the repair of the boilers, there would be a balance of £37 14s. 2d., which it was proposed to carry to the reserve-fund, which would then amount to £70 3s. 5d. The Directors had entered into a contract with Messrs. Harvey and Co., of Hayle, Cornwall, for supplying an engine and two boilers for the sum of £3435. The engine and boilers were to be completed and ready for work on the 1st of December next, but the contract for the new buildings had not yet been entered into.

**WATER PURIFICATION.**—At a meeting of the Society of Engineers, held on Monday, March 4th—Robert P. Spice, Esq., President, in the chair, a paper was read by Mr. J. Walter Pearce, on "Water Purification, Sanitary and Industrial." In his opening remarks, the author observed that, until the Metropolis was furnished with a supply of water from pure sources, private filtration was necessary, and chemical purification was required, as well as mere mechanical filtration. Great diversity of opinion existed as to the value of the various substances used as purifying media, and also as to the form of filter. The first record of a water filter was in 1790, when Johanna Hempel employed porous vessels, and in the following year the ascending principle was first mentioned. Vegetable charcoal, as a filtering medium, was first named in 1802, animal charcoal in 1818, and solid blocks in 1834. Turning to the modern practice of filtration, the author observed that Atkin's system embodied the last-named principle, finely divided charcoal being agglomerated into porous blocks. The advantage of employing carbon in that form was that the impurities were arrested on the surface, and were easily removed. Major Crease, R.M.A., compressed loose animal charcoal in a granular state between plates, by means of a screw, the amount of compression being determined by the degree of impurity in the water to be filtered. Major Crease's system is adopted in the Army and Royal Navy. The chief characteristic of Mr. F. H. Danchell's filter was that the ascending principle was used, so that impurities, instead of lodging on the top, fell back on to the bottom of the tank. The Sanitary Engineering and Ventilation Company use mineral carbon as a filtering medium, and cause their cistern filter to be cleansed by the inrush of the supply, and also by reversing the flow. In the Silicate Carbon Filter, mineral charcoal is used as the filtering medium, the main supply filter having three slabs with layers of coarse and fine granular carbon between. In Professor Bischoff's spongy iron filter, the iron exerts a powerful influence on the water, impregnating it with iron, which is afterwards oxidized and arrested, leaving the water pure. M. Le Tellier's hydrotrietic purifier was described as removing the hardness from water by throwing down the lime, which was afterwards intercepted by filtration through charcoal.



ROYAL UNITED SERVICE INSTITUTION.—On Wednesday, the 6th inst., a lecture was delivered at this Institution, by Mr. A. M. Silber, on "Improvements in Lights for Signalling and other Naval and Military Purposes"—Admiral Sir Frederick Nicholson in the chair. After a sketch of the history of artificial illumination, Mr. Silber traced an outline of the chemical process of combustion, and described the direction and force of the flow of air around a naked flame. In continuation, he said that the problem before him was how to construct a lamp-case or lantern which should supply the contained oil-burner with precisely the amount of air required for complete combustion, render a chimney unnecessary, allow the freest exit to hot air, and to the products of combustion, but be absolutely weather-proof, and so far impervious to wind-waves that their impact should neither diminish nor increase the speed or the quantity of the air supply of the flame. "I have now the pleasure," he continued, "of placing before you ships lanterns for masthead and for port and starboard lights, in which all these requirements are fulfilled. They burn colza oil, and, with modifications of construction, would burn petroleum, if required. They have no chimneys, they give the light equal to that of about 15 standard candles, and when reinforced with a reflector, and concentrated by a cut dioptric lens, equal to that of 50 standard candles, can be seen on a clear night at a distance exceeding five miles. They will burn for eighteen consecutive hours, with no important diminution of the light, requiring only, if the full size of the flame is to be maintained, that the wicks should be turned up a little every six hours, this being done without opening the door or disturbing the flame. They can be filled and trimmed by the use of one hand only, leaving the other free for holding on, and, as a new wick is dropped in at each trimming, there is no liability to derangement of the flame." Mr. Silber exhibited a masthead and a hand lamp adapted for signalling, in which the light could be obscured or revealed in a moment, so that signalling by flashes could be accomplished with great facility. The hand signalling-lamp was also so constructed as to answer the purpose of a cooking-stove, and might thus render a bivouac fire superfluous. In conclusion, the lecturer discussed the risks attending the use of petroleum on shipboard, and the best way of obviating them, and finished by a tribute to the Admiralty and to naval officers for the cordial assistance which he had received from them. A discussion ensued, in which several gentlemen took part, and very warm praise was bestowed upon Mr. Silber's system of lighting. Amongst other gentlemen Captain Colomb, whilst criticizing some details, bore testimony to the general excellence of the system. A cordial vote of thanks was passed to Mr. Silber for his paper.

### Register of New Patents.

#### APPLICATIONS FOR LETTERS PATENT.

- 865.—MILLAR, R., Kilmarnock, N.B., "A new or improved meter, applicable for measuring water or other liquids, part or parts thereof being applicable to piston-meters generally." March 4, 1878.  
 880.—BREDO, R., Germany, "Improvements on rotary pumps and on exhausters." March 4, 1878.  
 884.—LEEDER, F. G., Glasgow, "Improvements in apparatus for measuring fluids or obtaining motive power." March 5, 1878.  
 891.—BARROW, J., Clayton, Lancs, "Improvements in manufacturing ammoniacal salts and utilizing certain waste products." March 5, 1878.  
 901.—BROWNE, A., Southampton Buildings, London, "Improvements in filter-presses." A communication. March 5, 1878.  
 902.—NEALE, M. T., Adelphi, London, "Improvements in transmitting light and apparatus therefor." March 5, 1878.  
 907.—GUNN, E. S., City Road, London, "Improvements in filters." March 6, 1878.

- 924.—HOPCRAFT, E., Brackley, Northamptonshire, "The purification of water by filtering through animal charcoal, and for the purification of the animal charcoal by oxidation." March 7, 1878.  
 925.—ROETTGER, E. C., Finsbury Park, London, "Improvements in filtering presses for expressing the more liquid parts from the more solid parts of semi-liquid matters." March 7, 1878.  
 929.—DRONIER, P., Paris, "Improvements in electric lamp-lighting apparatus." March 7, 1878.  
 939.—HEATHORN, T. B., Knightsbridge, London, "Improvements in appliances for obtaining motive power from liquids or fluids." March 8, 1878.  
 942.—LINFORD, C., Leicester, "Improvements in gas-engines." March 8, 1878.  
 949.—HENDERSON, G., and McNEIL, D., Blackfriars Road, London, "Improvements in valve cocks or taps." March 8, 1878.  
 956.—SILBER, A. M., Whitecross Street, London, "Improvements in lamps, especially applicable to railway, ships, and other exposed lamps." March 9, 1878.  
 989.—JENNINGS, G., Stangate, London, and HINDE, G. J., George Street, Wolverhampton, "Improvements in filters for filtering and purifying water." March 12, 1878.  
 1000.—GARROOD, G. W., Twickenham, London, "Improvements in cocks, taps, and valves, for water and other fluids." March 13, 1878.  
 1006.—BERNAYS, A. J., Lambeth, London, "Improvements in filters for purifying water." March 13, 1878.  
 1011.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in filtering apparatus." A communication. March 14, 1878.  
 1024.—NAWROCKI, G. W. von, Berlin, Germany, "Improvements in stop-valves especially suitable for water-pipes." A communication. March 14, 1878.

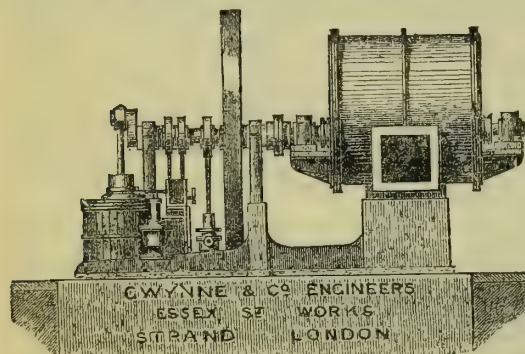
#### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 3397.—DENNETT, J. C., Altona, Germany, "An improved water-meter and water power motor-valve motion and regulator." Sept. 6, 1877.  
 3434.—CAMERON, J., Salford, Lancs, "Improvements in pumps." Sept. 11, 1877.  
 3445.—EVANS, F. J., Brentford, Middlesex, and SUGG, W. T., Westminster, "Improvements in the manufacture of coal gas, and in the treatment of ammoniacal liquor obtained in such manufacture." Sept. 12, 1877.  
 3515.—KEMP-WELSH, S., Billiter Street, London, "Improvements in apparatus for filtering liquids." Sept. 18, 1877.  
 3980.—QUAGLIO, J. von, Stockholm, Sweden, "Improvements in purifying coal gas from bisulphide of carbon and other sulphur compounds." Oct. 27, 1877.  
 3992.—WIRTH, F., Frankfurt-on-the-Maine, Germany, "Improvements in apparatus for and in the treatment of ammoniacal liquids." A communication. Oct. 29, 1877.  
 4114.—BECK, G., Queen Square, and JUSTICE, P. S., Southampton Buildings, London, "Improvements in nozzles for the escape of steam or gases under pressure." Nov. 5, 1877.  
 4282.—ASBURY, C., Balsall Heath, Warwick, "Improvements in rotary pumps and motive-power engines." Partly a communication. Nov. 15, 1877.  
 4398.—SCHÜLKE, J., Berlin, "Improvements in dry gas-meters." Nov. 22, 1877.  
 4435.—VABLEY, S. A., Hatfield, Hertford, "Improvements in electrical apparatus for lighting and other purposes." Nov. 24, 1877.  
 4617.—GALLOWAY, C. J., and BECKWITH, J. H., Manchester, "Improvements in pumps for raising or forcing liquids." Dec. 6, 1877.  
 4928.—KIRKHAM, T. N., Westminster, HULETT, D., High Holborn, and CHANDLER, S., sen. and jun., Newington Causeway, London, "Improvements in apparatus for condensing, washing, and purifying gas and other vapours." Dec. 29, 1877.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS;

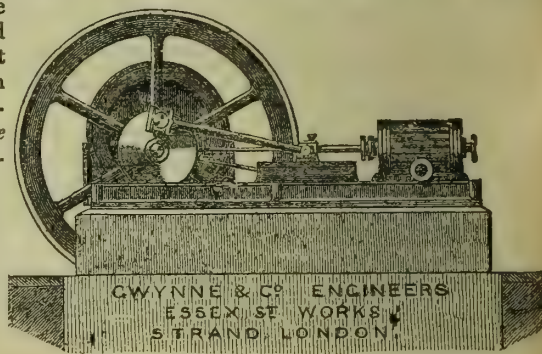
Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

## GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

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EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

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## TO GAS ENGINEERS.

### D. BRUCE PEEBLES & CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

## TAY WORKS, BONNINGTON, EDINBURGH.



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TO CORRESPONDENTS.

BRITISH ASSOCIATION OF GAS MANAGERS.—Amongst the communications received, and which, in the exercise of the best judgment we could form on the subject, it has not appeared desirable to publish, was one from a Midland Counties Manager. Our decision has not given satisfaction to him, and he thus writes: "The Committee of the Association are not only sufficiently powerful to prevent open discussion of their policy, but also potential in closing the columns of the JOURNAL OF GAS LIGHTING to its subscribers." We make no further reply than to say, that the insinua-

tion is perfectly groundless, and is as insulting to the Committee as it is to us.

J. H., Glastonbury.—Sewer-gas mixed with air is explosive, but in all probability, in the case you mention, there was a leakage of coal gas into the sewage-tank. It would not require a light applied in the immediate vicinity of the tank, for flame will "back" a long distance. Without a flame there could have been no explosion.

THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 26, 1878.

Circular to Gas Companies.

WE were led to speculate that the Board of Trade intended to try and amend Metropolitan Gas Legislation by introducing a general measure to alter the penal clauses of recent special Acts. It appears no such intention is entertained, for this session at all events; and, therefore, the Gas-Works Clauses Amendment Bill will be the only measure relating to gas which the Government will introduce at present. We have already pointed out what may possibly be the effect of Section 40 of the Bill above named. As it stands, we may take it that, construed, like the Act of 1871, to apply to all existing statutory Gas Companies, the section which we have named will give a Magistrate discretionary power to mitigate the penalty when a Gas Company are convicted of any default. If our construction be held to be good, we shall remain perfectly content; but if any inmitigable fine be inflicted, which is to go into the pocket of the Metropolitan Board, we shall continue to object, and urge upon the Government the propriety of introducing an amending Bill. We have recently pointed out that offences may differ so essentially in degree that it would be the height of injustice to inflict a fixed penalty for every defect; it is gratifying, therefore, to find that the Board of Trade take a sensible view of the matter, and are not disposed to pander to the selfish propensities of the Metropolitan Board of Works.

To report the accounts of a Metropolitan Gas Company is now, happily, to record only a continued success. The report of the London Gaslight Company is no exception. The statement made by the Directors is, that after providing for interest on mortgages, and dividends on preference shares, there remains a net profit which allows of the declaration of maximum dividends on all classes of ordinary stock and share capital, leaving a balance of over £4000 to be carried to the reserve-fund. This fund has now reached the respectable amount of £48,000, equal to the payment of more than the year's dividends. In spite of reductions, which have benefited the customers of the Company to the extent of over £15,000 per annum, the Company's profits still increase, and we hope they may continue to do so.

We have received the report of the Directors and the statement of accounts of the South Metropolitan Gas Company for the past half year. The balance applicable to dividend on the ordinary share capital is £39,432, which, as the Company charged but 3s. 2d. per thousand cubic feet, while their initial price is 3s. 6d., allows the division of eleven per cent., which the Directors accordingly recommend. It has been decided to reduce the price of gas, from the beginning of the year, to 3s., so that next half year the Company may divide eleven and a half per cent., if they can earn it with the reduced price. Prosperity such as is here indicated is almost unparalleled in the history of statutory gas undertakings.

The half-yearly report of the Directors of the Phoenix Gas Company has also just been issued. The net revenue of the half year was £46,266. Out of the available net revenue the Directors recommend a dividend at the rate of ten per cent. on the £20 fully-paid shares, as well as dividends on the £20 new shares (on £6 of the £16 paid), on the capitalized stock paid in full at five per cent., and on the new stock (seventy per cent. paid) at seven and a half per cent., leaving £5035 to be carried forward. We are glad to see that the reduction of price in October last has had a favourable effect, the consumption showing an increase.

The Alliance and Dublin Gas Company again divide ten per cent., and carry forward a large balance. We shall refer again to this Company, when we have the full accounts before us.

The Sheffield United Gas Company are, of course, prosperous. They pay maximum dividends on all classes of stock and shares, and have a balance of over £14,000 to carry forward, which leaves them with a high reserve. It is worthy of mention that the price of gas has been reduced since the beginning of this year from 2s. 10d. to 2s. 9d. per thousand feet—a step fully



justified by the abstract of accounts now published. A good deal of noise has recently been made in the Sheffield Town Council about "Nominee Directors," and some gentlemen who do not enjoy the distinction have endeavoured to represent that such appointments are a farce. They may or may not be a farce; but, if they are, it is simply the fault of the Directors so nominated. They are, of course, in a minority on the direction, but minorities have the power of making their existence and influence known and felt; and we are satisfied that the gas consumers of Sheffield have no reason to regret the appointment of "Nominee Directors." The suggestion that they are in collusion with the Company's Directors is a pure scandal.

The Sheppy Gas Company have had a prosperous half year, and pay maximum dividends, carrying forward a fair balance. The Directors are about to take a step which we consider eminently judicious. They do not reduce the price of gas directly, but they offer all consumers a discount for prompt payment of accounts, which will, virtually, be equal to a reduction of threepence per thousand feet. Our readers have been informed of the various steps which the Sheppy Gas Company have taken to popularize and increase the consumption of gas, and we are happy to congratulate them upon having achieved some success in this direction. Perseverance is, however, necessary, for we notice that the increase has only amounted to twenty-nine per cent. in seven years; this is below the normal amount in a growing locality.

The Gas Committee of the Corporation of Birmingham publish a statement, which will be found on another page, showing the comparative cost of the manufacture and distribution of gas in the last year of the two Companies existence—1875—and subsequently under the *régime* of the Corporation. The comparison is hardly fair, for the Companies were, at the period named, just emerging from difficulties. The Corporation, it is quite true, have effected many economies, and have made large profits; but the Birmingham consumers cannot be congratulated upon the result. It is quite certain that gas should be cheaper in Birmingham, and there are many in the borough who share our opinion on this matter. We may leave the question, however, for, as out-townships emancipate themselves in the course of another two or three years, when the supply of little more than Birmingham proper will only have to be considered by the Corporation, no doubt a considerable alteration in the state of affairs will take place. The high prices now paid by some of the out-districts will no longer be available, but, at the same time, a considerable amount will be written off the capital account of the Corporation. In time, no doubt, the Birmingham consumer will gain some advantage; at the present moment his condition cannot be considered apart from that of his neighbours.

It may now, we think, be taken for granted, that the works of the Exeter Gas Company will soon pass into the hands of the Corporation. These latter will thus have the opportunity of showing whether they can manage matters so well as to prevent such complaints as have been constantly brought against the Gas Company for the last two or three years. It is true that Local Authorities enjoy an immunity from persecution which is not accorded to commercial bodies. We expect that the disappearance of the Company will not be much regretted in Exeter. The Shareholders will, no doubt, be satisfied with the price they will obtain for their property, and the citizens will look cheerfully forward to gas manufactured without causing a nuisance, and sold at a cheaper rate. The terms offered by the Corporation are those now usually accepted, unless under special and particular circumstances—viz., annuities equal to maximum dividends, redeemable at twenty-five years purchase, the Corporation to take over the mortgage debt of the Company, leaving them the reserve-fund. It is proposed that clauses to give effect to the arrangement, if concluded, shall be inserted in the Company's Bill, now in the Commons, and the Corporation shall take possession of the undertaking on Midsummer-day next.

Terms for the sale and purchase have been arranged between the Bangor Local Board and the Gas and Water Company. The Shareholders are to have ten per cent. on all the subscribed capital, redeemable, as usual, at twenty-five years purchase. There is nothing unusual in the other provisions. Great expectations are entertained of the transfer. It is thought that in the course of a few years the Local Board will make, at least, a thousand a year profit, which, expended for public purposes, will do great things for Bangor.

Perhaps it would not be well to be too confident about profits, for it is not every Local Authority that realizes them. There is the Corporation of Richmond, Yorkshire, for instance, who have had a gas undertaking for a great number of years, and their balance-sheet for the past years, succinctly put, stands thus:—Receipts, £1644; expenditure, £2561; showing a deficiency of

£917. How this is to be made good we are not informed. The Corporation of Richmond must, we fear, be an *unreformed* body.

A case occurred at Portsmouth the other day, which well exhibits the propriety of allowing discretionary powers to Magistrates. The Portsea Island Gas Company are required to supply gas of 14-candle illuminating power; but on three days last November the Corporation Examiner reported the gas as below the standard. The deficiency does not seem to have been much, the lowest experiment showing 12·6 candles. It appeared from a report laid before the Magistrates, that the average quality of the Company's gas supplied was 15½ candles, and was sometimes as high as 17 and 18. For the deficiencies, which occurred last November, the Corporation prosecuted the Company in the past week. The defence of the Company was that the deficiency occurred from unavoidable causes; and after some rather strong remarks by the sitting Magistrates on the unreasonable delay, the Corporation withdrew the summonses. If they had not been withdrawn, we feel satisfied that the Magistrates would not have convicted under the circumstances.

The abstract of accounts published by the Corporation of Wigan states that, during the past year, the profit made on the gas undertaking amounted to £13,929 10s. This represents a very different state of affairs to that drawn by Mr. Templeton, and we may express a hope that the Gas Committee are right in their calculations.

There is, no doubt, a future for the Imperial Water and Gas Corporation, Limited; but we hope that no great delay will be experienced in commencing real business. We are happy to see that the Directors have several proposals before them. England is now pretty well studded with gas-works, but much remains to be done for the supply of water. Unhappily, water-works are, as a rule, less remunerative than gas-works; but in these days investors have to be content with small interest. We are inclined to think one of the most promising fields for the Company's operations is, as they propose to assist Local Authorities, in the institution of water-works. A small staff of Engineers, well acquainted with the hydrology of England, would be of the greatest service.

### Water and Sanitary Notes.

THE adjourned debate on the second reading of the Metropolis Water-Works (Purchase) Bill now stands adjourned until the 4th prox., which happens to be the evening on which the Chancellor of the Exchequer makes his financial statement. We do not know who is responsible for this stupid blunder; but, after all, there may be a reason for it, and we recommend the friends of Water Companies to be in their places. The House on these occasions, as a rule, empties quickly after the Chancellor of the Exchequer sits down; and the addition to the income-tax, which the Chancellor will probably have to announce, will perhaps have the effect of making Metropolitan Members, at all events, consider whether, or not, they are inclined to have their rates increased along with the income-tax.

The Corporation of Liverpool, in deference to the persistent efforts of Alderman Bennett and a small following, have begun to deepen their well at Bootle, with a view to tap the subterranean lake which the worthy Alderman and his friends suppose to exist at an uncertain depth. According to the last report, the borers have penetrated to the depth of 701 feet, but have not yet tapped the lake, or come upon any water-bearing stratum which can add much to the resources of the Liverpool Corporation.

The Thirlmere scheme of the Manchester Corporation is still under the consideration of the Committee of the Commons, but we hope it will be settled before the recess. So far as we have been able to observe, the evidence on the part of the opponents of the scheme has been extremely weak, and we hope sincerely that the Manchester Corporation will carry their scheme. Liverpool will, next year or the year after, have to come forward with a grand scheme (we take it as a matter of course that the wells scheme will fail), and presently England and Scotland will have water undertakings worthy of their wealth.

In obedience to a motion made by Sir U. Kay-Shuttleworth, a return has been made to the House of Commons of a report, by Dr. Frankland, on the state of the Metropolitan Water Supply during the year 1877. Like all that the author has written on the subject for the last few years, this report is strongly condemnatory of the Thames and the Lea as sources of supply. Still, however, he is fain to admit that, during the period over which his observations have extended—viz., the last ten years—the Companies have made great improvement in the condition of the water they furnish. Turbidity is now rarely seen; organic matter has been greatly diminished in amount; living and moving organisms are getting very scarce; and, indeed, the only bugbear now left is "previous sewage contami-



"nation," a species of mystification of which we hoped we had heard the last.

One object of the report seems to be to call attention to the waste of water flowing from springs in the chalk, which eventually finds its way to the Thames, according to Dr. Frankland, even after protracted drought, and runs over Teddington Weir at the rate of 350 million gallons a day. Dr. Frankland asks if it be impossible for engineering skill to impound this bountiful supply of pure potable water for the domestic service of the Metropolis.

Parliament has rapidly disposed of the Gas and Water Bills this year, and, unless the Metropolis Water-Works (Purchase) Bill should obtain a second reading, there will remain no measure for consideration after the Easter recess. In the House of Commons, the Cheltenham Water Company's Bill has been reported, "Preamble not proved." As we write, the measure promoted by the Corporation is still in the balance. The result will, no doubt, be the speedy transfer of the Company's undertaking to the Corporation. The two Scarborough Water Bills have been passed as unopposed measures by Mr. Raikes, Chairman of Committees. This, of course, indicates that the works of the Company are for sale, and will be bought.

### Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

#### GAS PROPERTY, GAS ENGINEERS, AND THE YORK GAS COMPANY.

SIR,—If it be so "very fine to see one's name in print," I cannot feel too much obliged to your correspondent, "A Gas Shareholder," for having so liberally studded a column or more of your valuable space with mine. Still, however much indebted I might have felt, I had not intended taking any notice of his letter until yesterday, when it came to my knowledge that it had been reprinted and widely circulated in a separate form, with the object, as it appears to me, of bringing discredit upon my professional sincerity. And it is only on that account that I ask you to favour me by inserting a reply.

Your correspondent's first objection to my advice to the York Council is, that I recommended a maximum price should be insisted upon, which should introduce an element of risk such as would necessitate enterprise, economy, and efficiency on the part of the Company. This proposition appears to me so reasonable, that I am simply amazed that any man in his right mind should dissent from it. Yet "A Gas Shareholder," aghast at such a revolutionary idea, finds ordinary type inadequate to express his astonishment, and resorts to italics. Talk not to such a man of enterprise and economy, for he is disquieted at the bare suggestion. For my own part, I have never conceived that the privileges granted by Parliament to Gas Companies were given, except out of regard to public interests.

In the next place, I have given offence by suggesting that the Company should accept such an addition to their powers, in regard to capital, as would suffice to meet their requirements for ten years. By reference to the Company's accounts, I had ascertained that the rate of expenditure on capital account for the past ten years had been £1000 per annum, and, therefore, I consider I was not illiberal in stating £20,000 as a fair sum to adopt.

I quite agree with "A Gas Shareholder," that where the rate of interest on capital employed in gas enterprise is but 5 per cent., or even less, there is little inducement to reckless expenditure; and I distinctly stated this fact in my report, though your correspondent has not had the candour to admit it.

As to the fairness of revising the conditions between Companies and Consumers at intervals of ten years, I fail to observe anything irrational in the idea, especially as no Company or Corporation whom I have ever served have escaped the necessity for an amended Act over a longer period.

Your correspondent then refers again to the question of maximum price. I had stated that an addition of 10 per cent. to prices current before the coal famine sufficed to yield the maximum dividend. "Where?" demands your correspondent. "Let Mr. Woodall—or anybody else—reply." At Burslem, I reply, and what I did myself I have little doubt many others were equally successful in accomplishing.

There I never had a contract for coals extending over more than one year, and during the severest of the panic, my contract did not cover more than half my requirements; in consequence of which I was compelled to pay pit prices as they advanced, to occasionally limit manufacture, and to import coals from out-of-the-way districts.

The prices of gas were 3s. 2d. and 3s. per 1000 before the famine, and were raised to 3s. 6d. and 3s. 4d., which increase was, as I stated, about 10 per cent.

Now, I might have paid still higher prices for coal, and still maintained the dividend, had I drawn upon the reserve fund. But I had no occasion to touch it, nor can I call to mind ever having withdrawn a penny from reserve in my life, always having provided the maximum dividends out of the current year's business.

Next, I am called to task for having recommended a higher standard of illuminating power than 14 candles, as tested by Sugg's No. 1 "London" Argand, this quality being so low that until recently Lord Redesdale refused to sanction it in unopposed Bills. And I am accused of inconsistency on the basis of a report presented to the Leeds Gas Committee, wherein I opposed a proposition to increase the illuminating power of the Leeds gas from 16 to 18 candles.

Well, the quality of the gas here was ordered to be raised from 16 candles, as tested by the new burner, to 16 candles by the old one, an increase of a candle and a half, making the present standard quality in Leeds about three and a half candles, or just 25 per cent. in excess of that fixed by the York Bill.

Now, Mr. Editor, I do not say that the Company are now supplying, or purpose supplying, so poor a quality of gas as indicated by their Act. Then why should they risk their good name by opposing a regulation which only made present conditions obligatory?

There was a most generous disposition manifested towards the Company by the Council, and, as the Company were drawing up articles of agreement which were to be binding upon two parties to a contract over a number of years, it was certainly not unreasonable that the Council should object to these articles being dictated exclusively by the opposite party, on the principle of "Heads I win, tails you lose."

In ordinary business transactions we are not asked to accept the honour of a party as a guarantee for the due fulfilment of a contract, and I cannot help thinking that the York City Council have not acted with business-like care in allowing such an utterly worthless Bill—so far as gas consumers are concerned—as that of the York Gas Company to pass into law unopposed.

Leeds, March 23, 1878.

HENRY WOODALL.

#### WIGAN CORPORATION GAS ACCOUNTS.

SIR,—Your correspondent who has supplied you with information on this matter has stated that which is not true. The document which you say is a "counterblast to Mr. Templeton's pamphlet" has not "been referred back to the Committee for reconsideration." It has simply been presented to the Committee; but, being too lengthy to be considered sufficiently at one sitting, its further consideration has been adjourned.

With regard to the cutting off of the man's meter, the facts are these:—His account for gas was overdue—not "three," but "eight" weeks from the delivery of the account (Jan. 15), which was for gas supplied to the 31st of December last. In accordance with the rules of the department, customers are allowed one calendar month, after delivery of account, for payment, and to those who pay within that time a certain discount is allowed. This person neglected to pay his account, and thereby lost his discount; and after waiting till the 18th of February, and getting no response (and please note that this was previous to the pamphlet being issued), we sent him our No. 1 notice, reminding him of his account being outstanding, and requesting payment within seven days. No attention was paid to this; and after waiting a further twelve days, and the account still outstanding, a No. 2 notice was sent, demanding payment within three days, failing which the supply of gas would be cut off. Four days having elapsed from the delivery of the second notice, which, like the first, was treated with contempt, the gas was cut off. I enclose copies of notices sent, and I should like to know what other course, as Manager of these works, I could have taken.

I may add that, in the previous quarter, he had, in a similar way, failed to pay his gas bill, and after the usual notices had been served, only paid the account when men had been despatched to take away the meter. This is the person who charges the Gas Committee and their officials with incompetence in dealing with the gas accounts!

J. G. HAWKINS.

Borough Gas-Works, Wigan, March 22, 1878.

#### ANNUAL ACCOUNTS OF GAS COMPANIES.

SIR,—Referring to your replies to correspondents in the JOURNAL of this week's issue, I find that, in answer to "J. P.," of Weston-super-Mare, you state that the Gas-Works Clauses Act, 1871, which the Court of Queen's Bench have decided is applicable to all Companies whose Special Acts incorporate the General Act of 1847, provides that the annual accounts, filed with the Clerk of the Peace, shall be made up to the 31st of December in each year.

As I am unable to find, in the Gas-works Clauses Acts of 1847 and 1871, any such provision, and as I think it is of importance to many Gas Companies, who are unable, from several causes, to get their accounts completed and audited by the 31st of January, I shall feel obliged by your furnishing me with further information upon the subject.

The Gas-Works Clauses Act, 1847 (10 Vict. cap. 15, sec. 38), provides that the accounts shall be transmitted on or before the 31st of January in each year, but it does not mention that those accounts shall be made up to the 31st of December previously.

The Gas-Works Clauses Act, 1871 (34 & 35 Vict., cap. 41, sec. 31), provides that the undertakers shall fill up and forward to the Local Authority (not the Clerk of the Peace) of every district within the limits of the special Act, on or before the 25th day of March in each year, an annual statement of accounts made up to the 31st day of December then next preceding, &c.

I cannot find in this Act that the accounts are to be forwarded to the Clerk of the Peace.

W. J. RUSSELL, Secretary.

Croydon Commercial Gas and Coke Company, March 21, 1878.

SIR,—I observe your reply to my communication. I shall be much obliged if you will kindly inform me what clause of the Act of 1871, "provides that the annual accounts filed with the Clerk of the Peace shall be made up to the 31st of December in each year." I cannot find it. The Act of 1847, clause 38, expressly states that the accounts to be so filed shall be in abstract, and Mr. Michael, in his work on Gas Supply (repeated in the new edition), gives a form of accounts for the purpose. The same clause enacts that such accounts shall be filed before the 31st of January in each year. The penalty in default is £20.

Clause 35 of the Act, 1871, says nothing whatever about accounts to be filed with the Clerk of the Peace; but prescribes forms of accounts to be forwarded to the Local Authority by the 25th of March, made up to the previous 31st of December. I do not, however, see a single word that this is in substitution of the other provision, neither may it be said to be inconsistent with it. In fact, Mr. Michael treats the matter as quite distinct, and does not offer a word of comment upon the clause.

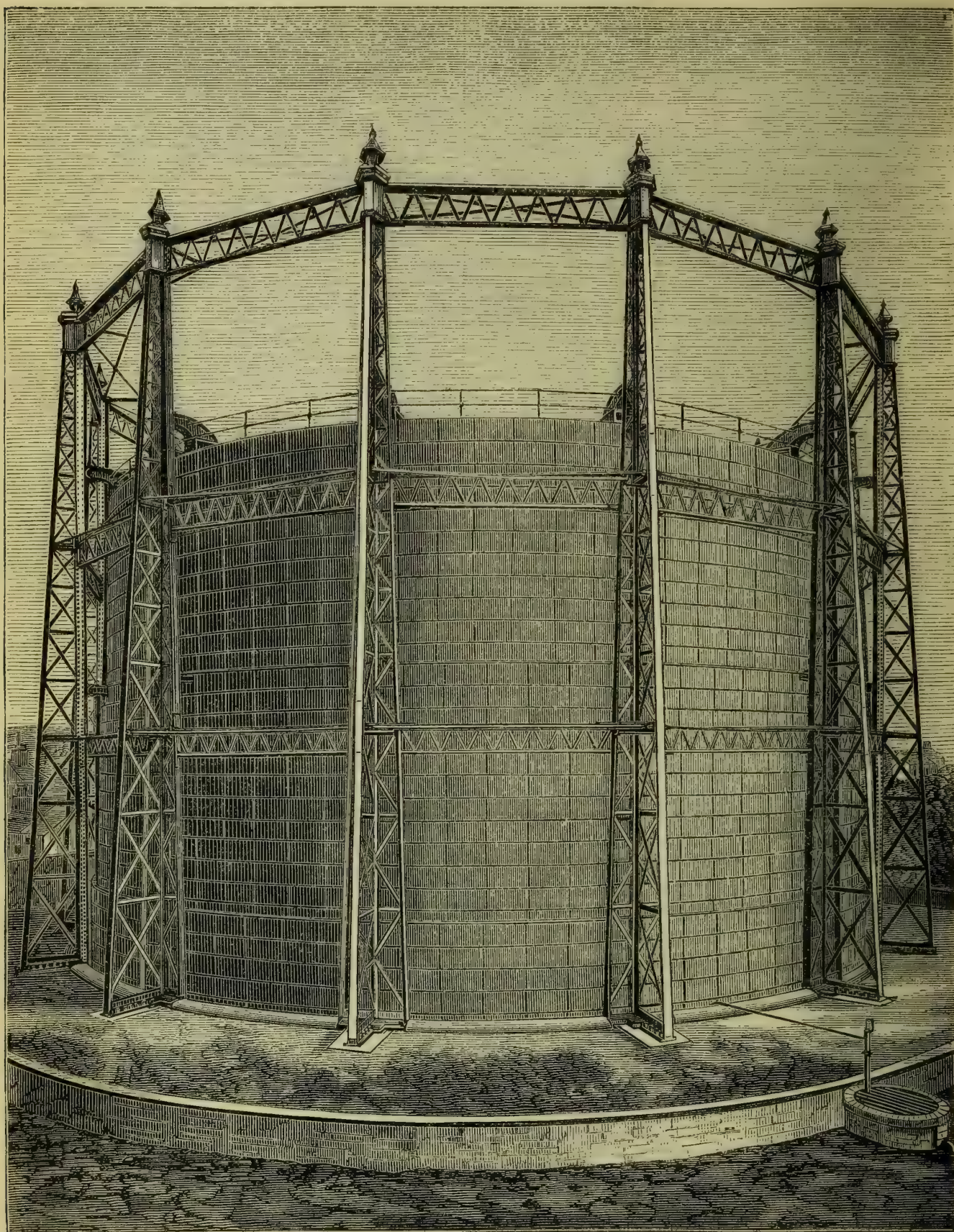
I shall be glad if you are right in your construction (as we have hitherto continued to prepare special accounts made up to the 30th of June, to comply with the requirement of filing the same in January, seeing that our meeting for passing the December accounts cannot, by our special Act, be held till February; but I confess I cannot see it.

Weston-super-Mare Gas Company, March 20, 1878.

J. PANES.



## GASHOLDER AT THE BRIGHTON AND HOVE GAS-WORKS.

*John Birch Paddon, Esq., Engineer.**Messrs. S. Cutler and Sons, Contractors.*

We illustrate above a large treble-lift gasholder (originally a single one), which has been erected at the Hove works of the Brighton and Hove General Gas Company. This holder was designed by, and carried out under the superintendence of, the Engineer to that Company, Mr. J. B. Paddon, M.I.C.E., the Contractors being Messrs. S. Cutler and Sons, of Millwall, London.

Special construction was necessary, in consequence of the limited area of site, and of exposure to the unimpeded force of the wind direct from the sea. The grips and cups are of unusual strength and depth, and to compensate for the loss of space arising from the extra depth of cups, the middle lift has been made deeper than the inside and outside lifts. This arrangement permits the guide-carriages to be fixed below the curbs, where they are in a position of great safety.

The guide-framing is of wrought iron, and has received great care

in the distribution and apportionment of materials according to the strains developed by the conditions under which the holder is worked. With an impact of wind equal to 50 lbs. per square foot, there is no part of the structure which would be exposed to a strain exceeding 5 tons per square inch of effective section.

The outer or bottom lift of the holder is 100 feet in diameter and 24 feet deep; the middle lift is 18 inches smaller, and 25 feet deep; and the top lift is 97 feet in diameter and 24 feet deep.

The holder has been uninterruptedly at work since October, 1876, and has given the greatest satisfaction. In no single instance has there been the slightest difficulty in the working of either of the three lifts. The construction of this work was effected under some adverse circumstances, one being that the Contractors were not permitted to empty the tank.



CORPORATION OF BIRMINGHAM, — GAS DEPARTMENT.

COMPARATIVE STATEMENT SHOWING EXPENDITURE AND RECEIPTS, WITH ANALYSIS THEREOF (COMPANIES AND CORPORATION) PER 1000 FEET OF GAS SOLD.

EXPENDITURE.																						
MANUFACTURE.					DISTRIBUTION.				LIGHTING, and Repairing Public Lamps.			MANAGEMENT.										
Coal, including Carriage, Unloading, and all Expenses of depositing at Works.	Furfing Materials and Wages.	Salaries of Engineers, Superintendents, and Officers at Works.	Wages at Works (Cart-bonzers).	Repairs and Maintenance of Works and Plant.	Salaries of Chief Inspector, Assistant Inspector, and Clerks in Light Office.	Repairs, Maintenance, and Renewal of Mams and Service-pipes, including Refitting, Paving, and Labour.	Repairing, Renewing, and Refitting Meters.	Lighting, and Repairing Public Lamps.	Rent, Rates, and Taxes.	Directors.	Salaries of Secretary, Accountant, and Clerks.	Salaries of Collectors and Clerks, and Commission.	Stationery and Printing.	General Establishment, Charges, and Incidentals.	Law and Parliamentary Charges.	Bad Debts.						
Birmingham Gas Company. Year ending Dec. 31, 1875 (800,404,000 cubic feet).	75,625 22-68	818 -24	950 -29	22,339 6-70	Includ. in 4.	2889 -86	Included in 6. 1003 -48	505 -15	3,796 1-13	690 -18	785 -23	894 -27	978 -12	894 -27	1032 -31	2236 -67						
Staffordshire Gas Company. Year ending Dec. 31, 1875 (1,539,722,000 cubic feet).	153,245 23-89	2075 -32	1625 -25	29,616 4-61	12,693 1-97	Included in 7. —	6145 -96	3001 -47	7,815 1-22	1240 -18	1420 -23	2972 -35	798 -12	2972 -35	—	1579 -24						
Companies. Total, 1875 (2,340,126,000 cubic feet).	228,870 23-47	2893 -30	2575 -27	64,648 6-63	Includ. in 4. —	7401 -76	7748 -80	3506 -36	11,581 1-18	1800 -18	2205 -23	3166 -32	1176 -12	3166 -32	1032 -11	3815 -39						
Corporation. Total, 1876 (2,378,000,000 cubic feet).	211,590 21-36	3975 -40	2628 -26	38,998 8-91	23,782 2-41	7376 -71	6455 -66	3208 -33	11,882 1-19	—	1671 -17	3375 -34	842 -08	3375 -34	545 -05	3805 -38						
Corporation. Total, 1877 (2,380,219,000 cubic feet).	170,126 17-15	5139 -52	2279 -23	40,630 4-03	32,908 3-32	8491 -86	8137 -69	3764 -37	12,722 1-27	—	1834 -18	3066 -31	863 -09	3066 -31	4349 -44	3407 -35						
EXPENDITURE (continued).																						
Expenses on Loans.	Bank Charges.	Interest on Temporary Loans.	Interest on Mortgage Bonds.	Interest on Debenture Stock.	Annul-ties.	Divi-dends.	Deprecia-tion.	Sinking-Fund.	Total Expendi-ture.	Sale of Gas after Deducting Discounts and Allowances.	Coke & Breeze, less Labour and Cartage.	Tar.	Am-moniacal Liquor.	Sundry Residual Products.	Rents.	Fittings.	Discount on Pur-chases.	Trans-fer Fees.	Bank In-terests.	Rental of Meters.	Total Receipts.	Net Profits.
19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.
789 -24	754 -22	9726 2-92	—	—	—	26,635 7-59	—	—	154,035 46-19	121,013 36-28	24,684 7-46	11,335 3-40	5,102 1-53	334 -10	94 -03	104 -03	401 -12	—	—	—	163,267 48-95	9,232 2-76
—	87 -01	889 -13	—	—	—	55,871 8-71	—	—	293,614 43-78	240,223 37-45	62,870 9-81	17,611 2-75	10,513 1-64	2471 -38	187 -03	2828 -45	252 -04	—	—	—	336,955 62-55	43,141 6-77
789 -08	841 -08	10,615 1-08	—	—	—	82,506 8-46	—	—	447,839 45-92	261,236 37-05	87,754 9-00	28,946 2-96	15,615 1-61	2805 -28	281 -03	2932 -31	653 -06	—	—	—	500,222 51-30	52,873 5-38
205 -02	76 —	3426 -34	2,673 2-41	1959 -19	56,270 5-69	—	4000 -40	3833 -39	435,483 43-95	314,144 34-74	70,790 7-14	31,165 3-15	16,271 1-64	456 -05	1411 -13	4352 -41	1005 -10	11 —	—	—	469,605 47-39	84,122 8-44
290 -03	59 —	1408 -15	28,492 2-90	1946 -19	55,617 5-61	—	—	3938 -39	417,043 42-05	342,614 34-54	55,863 5-63	39,205 3-36	16,584 1-67	182 -02	1417 -15	2662 -26	1184 -12	11 —	—	—	453,727 45-75	36,684 3-70
EXPENDITURE (continued).																						
Birmingham Gas Company. Year ending Dec. 31, 1875 (800,404,000 cubic feet).																						
Staffordshire Gas Company. Year ending Dec. 31, 1875 (1,539,722,000 cubic feet).																						
Companies. Total, 1875 (2,340,126,000 cubic feet).																						
Corporation. Total, 1876 (2,378,000,000 cubic feet).																						
Corporation. Total, 1877 (2,380,219,000 cubic feet).																						
Secretary's Office, Birmingham, March 15, 1878.																						



## Parliamentary Intelligence.

## HOUSE OF LORDS.

MONDAY, MARCH 18.

A petition for additional provision in the Leicester Corporation Bill, together with proposed amendments, clause, and schedule annexed thereto, was presented from the Leicester Corporation, and referred to the Examiners.

Bill reported from the Select Committee, with amendments:—Trowbridge Water.

Bills read the third time, passed, and sent to the Commons:—Batley Corporation Water; Exeter Gas.

TUESDAY, MARCH 19.

The Examiners reported that no further Standing Orders are applicable to the Hartlepool Gas and Water Bill.

Bill reported with amendments:—Clitheroe Gas, Water, and Improvement.

THURSDAY, MARCH 21.

Bills brought from the Commons, read the first time, and referred to the Examiners:—Bangor Local Board; Sevenoaks Water.

FRIDAY, MARCH 22.

A petition for additional provision in the South Staffordshire Water Bill, together with proposed clauses annexed thereto, was presented from South Staffordshire Water-Works Company, and referred to the Examiners.

The Examiners reported that the further Standing Orders applicable to the Brading Harbour District Gas Bill have been complied with; and that the Standing Orders have not been complied with in respect of the petition for additional provision in the Leicester Corporation Bill.

Bill brought from the Commons, read the first time, and referred to the Examiners:—Southport Water.

Bills read the third time, passed, and sent to the Commons:—Clitheroe Gas, Water, and Improvement; Forfar Water.

## HOUSE OF COMMONS.

MONDAY, MARCH 18.

Bills, as amended, considered, and ordered for third reading:—Marske and Saltburn Gas; Southport Water.

Lords Bill read a second time, and committed:—Deal Water.

Lords Bill read the first time, and referred to the Examiners:—Bedlington Local Board Water.

The Cheltenham Water Bill was reported, "Preamble not proved."

The Examiners reported that no Standing Orders not previously inquired into are applicable to the Dublin Corporation Water-Works Acts Amendment Bill (Lords).

Petitions against the Manchester Corporation Water Bill, and for dispensing with Standing Order 129 in the case of the said petition, were presented from Hyde Local Board.

A petition in favour of the Nottingham Water Bill was presented from Duke of Portland\*; and one against the Bill, for the insertion of a clause (the petitioners not praying to be heard), was presented from Inhabitants and owners of property in Carlton.

The petitions were withdrawn of North-Eastern Railway Company against the Scarborough Water Bill; and of London and North-Western Railway Company against the West Houghton Local Board Bill.

TUESDAY, MARCH 19.

Bills reported:—Durham Water; Shrewsbury Gas; West Houghton Local Board.

Bills read the third time, and passed:—Bangor Local Board; Sevenoaks Water.

Bill read a second time, and committed:—Radcliffe and Pilkington Gas.

Lords Bills read the first time, and referred to the Examiners:—Batley Corporation Water; Sutton-in-Ashfield Gas.

The following resolution reported from the Standing Orders Committee was agreed to:—"That in the case of the Manchester Corporation Water Bill, petition of the Hyde Local Board for dispensing with Standing Order No. 129 in the case of their petition against the Bill, the said Standing Order ought to be dispensed with."

WEDNESDAY, MARCH 20.

Lords Bill read a second time, and committed:—Imperial Continental Gas Association.

Lords Bill read the first time, and referred to the Examiners:—Exeter Gas.

Bill reported:—Bradford Water and Improvement.

Petitions against the Metropolis Water Supply Bill were presented from the Vestry of St. Pancras, and (the petitioners not praying to be heard) Representatives of Vestries and District Boards of the Metropolis.

THURSDAY, MARCH 21.

Bill read the third time, and passed:—Southport Water.

FRIDAY, MARCH 22.

Bills reported:—Cockermouth and Workington Water; East Grinstead Gas and Water; Scarborough Corporation Water; Scarborough Water; South Hants Water.

Bill read the third time, and passed:—Marske and Saltburn Gas.

Bill, as amended, considered, and ordered for third reading:—Farnworth and Kearsley Gas.

## HOUSE OF LORDS COMMITTEE.

TUESDAY, MARCH 5.

(Before the Marquis of RIVON, Chairman; Earl WALDEGRAVE, Earl COTTENHAM, Lord VENTRY, and Lord MONTEAGLE of BRANDON.)

EXETER GAS BILL.

Mr. POPE, Q.C., Mr. MICHAEL, and Mr. PITT LEWIS appeared for the promoters; Mr. GRANVILLE SOMERSET, Q.C., and Mr. BALFOUR-BROWNE for the Corporation of Exeter, petitioners against the Bill.

Mr. POPE, in opening the case for the promoters, said the object of the Bill was to empower the Exeter Gaslight and Coke Company to acquire further land for the extension of their works, and also to raise additional capital, and for other purposes. The existing works of the Company, being very old, were not such as modern requirements looked upon as necessary, and the object of the Bill was to enable the Company to acquire the capital necessary to remodel their works, and place them upon a footing commensurate with the interests of the city of Exeter. The Corporation did not deny that a considerable amount of capital was necessary for that purpose, but they went further, and intimated that they were desirous of a clause enabling them, when they liked, and how they liked,

to acquire the property of the Company for themselves, instead of allowing the Company to derive the profit their enterprise deserved. The Company were incorporated in 1816, and for 20 years, the population of Exeter being very small, they continued their operations under that old and antiquated Act, without any further amount of capital being authorized, the original capital being only £12,000. In 1836 their capital was found insufficient, and the Company obtained another Act, which increased the amount to £40,000; but in neither Act were any borrowing powers authorized. In the same year, 1836, a rival Company were established, with a small capital; but, in about three years, the result was an amalgamation between the two Companies. In 1851 another attempt was made to form a Consumers Company, but it was abandoned. In 1852 the balance of the capital power of the old Company was exhausted, and they did what was undoubtedly an illegal thing—they applied a portion of their profits to the extension of their works—so that in 1865, when they applied to Parliament for the Act under which they were at present carrying on their operations, they had expended more than £11,000 over and above their capital of £40,000. But the price of gas had been reduced from 9s. 6d.—which it was originally—to 4s. per 1000 in 1864, and they paid dividends ranging from 10 to 8 per cent., but about an average of 8 per cent. In 1865, Parliament passed the Company's Bill, authorizing the capitalization of £10,000, out of the £11,000 which had been expended, at a certain rate of interest; but they also allowed the raising of additional capital of £20,000, with a dividend of 7 per cent. The works had now, however, become old fashioned, and the Company asked the Committee to sanction their raising a sufficient sum of money to place them in a satisfactory condition. There had latterly been a not unnatural desire on the part of Local Authorities to possess themselves of gas and water undertakings, but, except in one instance, Parliament had never sanctioned the compulsory acquisition of property of that class by Corporations. The result of parliamentary inquiries during the last 12 or 15 years had shown that the interests of the consumers might be as effectually protected by the general legislation upon which Parliament had insisted as by the acquisition of undertakings by Corporations. In the previous session, in order that consumers might be placed in positions of advantage, the House of Commons passed a Standing Order requiring that all new capital should be sold by auction, so that the public would give what the shares were actually worth, and the premiums realized were to go as part of the original capital; so that, supposing the Exeter Gas Company were to find it necessary to raise £100,000, instead of being allowed to raise that amount of dividend-bearing capital, they would only be allowed to issue, say, £80,000 worth of stock, and apply the £20,000—the additional sum which the public would give for the shares—as capital which would not bear dividend, and therefore would not be chargeable against the consumers. But as a compensation for that, it was provided that if, by economy and good management, they could succeed in reducing the price of gas beyond a specified standard, they should receive a certain increase of dividend, whereas, on the other hand, if by bad management or by accidental circumstances, such as the coal famine, the price of gas was increased, then the dividend was to be reduced in like proportion. The Company now proposed to raise £162,000—viz., £130,000 by the creation of shares, which, of course, would be issued subject to the auction clauses, with a dividend limited to 7 per cent., and by borrowing money for the remainder. It would be necessary to expend, within the next six or seven years, at least £110,000 in order to make the works what they ought to be, and that was really the whole of the Bill. The Company did not propose to increase their area of supply, to alter their illuminating power, to supply any worse gas, or anything of that kind, but simply to obtain money for carrying out necessary improvements. One of the grievances of the Corporation was that the works were at present a source of nuisance, and the Company admitted that many of the complaints were true to a certain extent, and it was to obviate those complaints that the Company made their present application. The Company still proposed to charge 4s. per 1000 for their gas, which was the price they had charged hitherto, and which they thought was a moderate price. The Corporation in their petition complained of the capital asked for as being excessive; but that was a common form of allegation, and the petitioners could not have been aware of the fact that, as the new capital must be put up to auction, the old grievances had been swept away, seeing that the Company could not issue those shares at a premium which the Shareholders could put into their pockets. The petitioners also alleged that the price proposed to be charged was excessive, that the pressure was quite inadequate, the illuminating power insufficient, and the testing-place being on the Company's works, useless and fallacious. They likewise objected to the standard of purity, and said the gas ought to be "supplied free from carbonic acid and sulphuretted hydrogen, so that such gas might not, in the process of consumption or otherwise, give off vapours injurious to health." The Company quite agreed with that sentence, and hoped the Committee would grant sufficient capital to secure for the future that there should be no ground for complaint on these points. The Corporation alleged that since 1865 there had been but slight amendments in the conduct of the works, and that so very badly had they been managed that on one occasion within the last twelve months, owing to some carelessness at the works, the whole of the gas in the public lamps went out suddenly. That was perfectly true, but the reason was that the works were not such as they ought to be, and as they would be if the Committee passed the Bill; but certainly not as they would be if the Corporation carried out their views and bought the works, because they gave no undertaking, neither did they say anything about improving the supply, or things of that kind. The petition also complained of the situation of the works, but in a gas manager's view, they were admirably placed. They were in the lowest part of the town, and for the purposes of gas-making and supply presented very considerable conveniences. How far the prevailing wind might be south-west, and waft any smell—if smell there were—might be a matter of opinion; but under such circumstances the smell ought to be reduced to a minimum. Then came the paragraph which was really the gist of the whole matter—"That the Bill contains no provision for requiring the Company, if and when thereunto required, to sell and transfer their undertaking to the Corporation as the Sanitary Authority." In other words, they complained that the gentlemen who were willing to find the money for the undertaking, for the purpose of putting it in order and making it efficient, should be unwilling to leave it in the hands of the Corporation, just when they liked and how they liked, to call upon them to part with their property compulsorily for the benefit of the Corporation. They also went on to say they "submit that, in accordance with the now frequent usage, a clause to this effect should be inserted in the Bill." That was a statement which ought not to have appeared in the petition. The Corporation might have claimed it, or asked it as a matter of argument; but they had no right to attempt to deceive the Committee by saying it was a "frequent usage" to insert such clauses in Gas Bills. They asked that "a clause to this effect should be inserted in the Bill; such sale, if called for, to be made upon terms to be then agreed on between the Company and the Corporation, or, failing such terms, by arbitration." Upon such terms as that, no men in their senses would advance money to put the concern in order, because as soon as that money began to receive the usual interest, somebody else

\* This petition is also against the Nottingham Improvement, Gas, and Water Bill.



would step in and take the profit out of their hands. The truth was that, in 1876, negotiations for the purchase of the undertaking were very nearly successful, and if the parties could agree, there was no reason why the transfer should not take place. But, in 1877, the Corporation became alarmed on account of the agitation about the electric light, and they passed a resolution that it was not expedient to proceed further with the negotiations for the purchase of the Gas Company. The Company then being in the position that the Corporation were sanctioning prosecutions against them for nuisance in consequence of the state of the works, it was impossible for them to allow matters to remain as they were, and they therefore applied to the Committee for means to put the thing right; but the Corporation, who refused then to buy, now came and said, "You shall not put it right unless you insert in your Bill a clause that we are to have the whole benefit of what you do, at what terms we like, and when we like, during the course of the undertaking." That was really the whole matter. The case of the Corporation was, to a large extent, the case of the Company. The latter must have the money, and they must do the work. The only question was, how much money? They must have it at such a price as would enable them to raise it. Another question was, what was the standard price which would enable the Company to pay 7 per cent., which was the acknowledged statutory dividend? Having settled those two matters, nothing remained for the Corporation to say, excepting they asked that it should be upon some terms which they were to have the benefit of, and not those whose enterprise found the money. The Corporation could not find a precedent for any such contention, and until they did, it could hardly be supposed they would prevail with the Committee more than any other Corporation.

Mr. William Cuthbertson, examined by Mr. MICHAEL.  
I was appointed a Director of the Exeter Gas Company in 1867, Deputy-Chairman in 1871, and Chairman in 1872. I was Mayor of Exeter last year, and for the last five years have been a member of the Local Board of St. Thomas, in which parish the gas-works are situated. In 1874 a complaint was made by Mr. Follett, who was then Mayor, of the nuisance occasioned by the gas-works, and I at once said to all the members of the Council, "If you will come and look over the works with us we will do our utmost to correct the matter, and no pains shall be spared by us in doing it." Captain Thompson also complained, and I went round the works with him over and over again, begging him to point out any error he could in the construction or working. I had the impression the smell came from the spent lime, while Captain Thompson said it arose from the chimney; but I said, "That is utterly impossible, for the chimney is only used for furnace purposes." We found, however, that there was continual complaint, and so I suggested to the Directors that they should have an eminent man to examine the works and point out the defects, and we engaged Dr. Letheby, who went over the works very carefully, and finally stated it was utterly impossible for any smell which arose from the works to reach as far as Colleton Crescent. Immediately after we had the report from Dr. Letheby, the Council themselves had down another eminent man—Dr. Redwood—and his account almost entirely agreed with Dr. Letheby's. During the time of my mayoralty, I was very careful that I would not show any disposition to take advantage of my position to promote the work of the Company as Chairman. In consequence of the complaints, Mr. Stevenson was engaged by the Town Council, and he came down and drew up a report, in which he condemned the works as being inadequate for the requirements of the present day, and said there must be an immense addition to the works. We had before that been considering an application to Parliament, but the transactions with the Town Council offering to buy us—and we were willing to sell—kept the matter in abeyance. After Mr. Stevenson's visit, we had Mr. Spice down to look over the works, and he reported that what Mr. Stevenson said was true. We then determined at once to apply to Parliament to correct the errors which were pointed out to us, and we now apply for the necessary money. We do not find fault with the way in which the Council have behaved. There was a petition got up by a certain number of inhabitants in the neighbourhood of Colleton Crescent, which compelled the Town Council to prosecute us. We had no complaints from the district of St. Thomas, although I requested our Inspector of Nuisances to go round and examine for himself, and let me know if there were any complaints. As Chairman of the Gas Company, if any complaints were made of the public lighting they would come to my knowledge, but the complaints were not so much of the state of the lights as of their being out. On one occasion I was called into the city because nearly all the public lights had gone out. Speaking generally, we have not had any complaints from the Town Council as to the mode of fulfilling our parliamentary obligations. Our object here is to obtain such capital as will allow the works to be thoroughly remodelled and put into proper order, to meet the requirements of the town, and to put ourselves under the further restrictions imposed by recent legislation with respect to gas undertakings.

Cross-examined by Mr. SOMERSET: Our present capital is about £70,000, and we propose to take powers to raise £160,000 more, which, in the opinion of Mr. Spice, will enable us to go on for about ten years to come. The works are reported to be in a very bad state; but I do not think so. I tried to discover the smells which were stated to be very offensive, but I could not.

Mr. MICHAEL: I may save my learned friend any more trouble about that. We were convicted of making a very bad smell, and if we did so it was very wrong of us. We committed a nuisance, and I hope we shall not do so again.

Cross-examination resumed: There are other members of the Town Council who have tried to discover these smells; but they have not been able to do so. I object to any power of purchase being put into this Bill, and I will give a reason for doing so. The Council and ourselves met on the most friendly terms, and once we almost completed the transfer of the works, and nothing could have been more fair and above-board; but at the last moment, when we were preparing our figures, it was moved in the Town Council by Mr. Follett, that it was inexpedient then to proceed further with the transaction. Of course, there could be hardly any way of dealing under such circumstances, and the matter was stopped. That was in 1877. I should think that if we spent this money we could hardly expect to realize a profit the first year or the second year; and it would be very unfair to compel the Company—speaking for the Shareholders who have advanced their money—to sell the works at the very lowest rate of interest they have returned. We do not propose to reduce the price of gas, because that would be impossible if we are to raise the capital which we shall have to expend for our works. The ratepayers will be in no worse position, because they will have the gas at the same price as now. Before we can get large dividends we shall have to lower the price of the gas. We shall be as anxious to do that as the consumers to receive it.

Re-examined by Mr. MICHAEL: I think an agreement is a very different thing from compulsion; and, speaking for myself, I should be willing to treat with the Corporation by agreement.

Mr. SOMERSET: Does that mean that you are going to put a clause into this Bill to sell by agreement?

Mr. MICHAEL: If you are willing to accept such a clause, I should be willing to insert it. I make the offer, that if you like to withdraw your

compulsory demand, I am willing to put in a clause enabling you to acquire the undertaking by agreement.

Mr. SOMERSET: We have many other objections besides that, which I cannot withdraw; but I will refer the matter to my clients.

Mr. Alfred Lass, examined by Mr. MICHAEL.

I am a public accountant, and have investigated the accounts of the Exeter Gas Company. At the present time the share capital—stock and shares—is as follows:—10 per cent. stock, £40,000 fully paid up; 4 per cent. stock, £10,000; and £20,000 raised in shares, 5 per cent. preference; altogether, £70,000. They have also raised on loans a sum of £7500, making the share and loan capital £77,500. That is to the end of 1877. The capital expended up to Dec. 31, 1877, amounts to £81,984 13s. 10d., showing an amount overdrawn of £4484 13s. 10d.

Cross-examined by Mr. SOMERSET: I do not think the Company have paid their maximum dividends for some years past. The loans are raised at £4 5s. and £4 7s. 6d. per cent.

Mr. W. A. Patfield, examined by Mr. LEWIS.

I have been Secretary to the Exeter Gas Company since 1872. In 1873 complaints were made of nuisances supposed to arise from the works, but the complainants themselves attributed those nuisances to Mr. Hicks's factory. Mr. Hicks at that time was taking the ammoniacal liquor from the Company, at a fixed price of 100 guineas a year; but in consequence of those complaints the Company arranged with him to remove his works, giving him an extended term of six years, at an increased rental of only £50 a year, as an inducement to go away. By that step the Company incurred a loss of £1500 a year. In 1874 the Mayor and Town Clerk visited various works, and made suggestions as to our conduct of the works, which were carried out to a very great extent. The principal suggestion was the use of oxide of iron for purifying, and that we have continued to use ever since. There has been a long correspondence between the Company and the Town Council, in which we asked the Council to point out any defect, and promised to remedy the same if it was shown to us. The Company gave Dr. Redwood every facility to examine the works, and his report, so far as it was founded upon the principal observation, was in favour of our works.

Cross-examined by Mr. SOMERSET: We are now paying 10 per cent., but it has only been for a short time. From 1866 to 1869 it was 8 per cent.; in 1870, 9 per cent.; in 1871, 10 per cent.; but we had a very favourable contract during that year; in 1872, 10 per cent.; in 1873, 9 per cent.; in 1874, 8 per cent.; in 1875, 8 per cent.; in 1876, 10 per cent.; and in 1877, 10 per cent. We lost £1500 a year through getting rid of Mr. Hicks, because we could have made the liquor into sulphate of ammonia at that profit.

Mr. SOMERSET: Did you make a profit of £1500 a year out of the liquor the year before he went, or any year previously?

Witness: We did not; we never made it. The highest price we ever made out of the liquor was £105 a year.

If you had made £1500 a year, that would really have come from the ratepayers, for you were paying your highest dividend, and you would have had to reduce your price?—That does not follow.

But it is the law, as you know. If you had made £1500—or whatever it was—it came from the ratepayers, and you would have had to have reduced your price?—It might have done so.

Re-examined by Mr. MICHAEL: Since the time we made the contract with Mr. Hicks ammoniacal liquor has very much increased in value, and therefore we should have had an opportunity of making a new contract at increased terms.

Mr. MICHAEL: With respect to the money, even if you were paying your maximum dividend then, and you got the £1500, that would have inured to the benefit of the Shareholders, if you had not paid the total amount of your back dividends?

Witness: Yes.

You have said that for several years you received only 9 and 8 per cent.; therefore all that money had to be recouped to the Company under the operation of the Gas-Works Clauses Act, 1847?—Yes. We had power to do so, but we have not done so up to the present time.

WEDNESDAY, MARCH 6.

Mr. Robert Paulson Spice, examined by Mr. MICHAEL.

I have been to Exeter three times to investigate the Company's works and business, the first time being in April of last year. I made a report in reply to one from Mr. Stevenson. I found the gas-works to be in an old-fashioned condition, but the Company were making alterations and improvements when I was there. My estimate of what is necessary to put the works right is £110,800—not in structures entirely, for they have exhausted their powers and entrenched upon different funds, and have had recourse to temporary borrowing; but to place those matters right as well as to build new works would cost £110,800. In that amount I have calculated the introduction of modern improvements, and meeting the requirements of the next ten years. I think that in twelve years all the share capital now asked for may be expected to be expended, and the Company must come to Parliament again. The Shareholders in an existing undertaking have no interest whatever in the expenditure of capital when auction clauses are introduced into the Act regulating their proceedings.

Mr. MICHAEL: In your experience, at about what rate per cent. would such capital be issued to the public?

Witness: That depends very much upon the credit the concern enjoys—what good repute it has. If it is in good repute, the public will form a favourable estimate of its chance of paying maximum dividends, and in that case 7 per cent. stock will command a premium, in the market generally, of about 40 per cent.

That is to say, capital which is entitled to a maximum dividend of 7 per cent. will really be issued only to cost the consumers 5 per cent.?—Yes; always assuming that the public in the district have a good opinion of it as to its power for earning the maximum dividend provided.

The 40 per cent. goes into the capital, and receives no dividend?—Yes; that enables the Company to sell gas at a lower price than they otherwise could do, and it gives security to the original Shareholders. An importation of non-dividend bearing capital must tend to increase the security of that which bears dividend.

Under these circumstances, then, has the Legislature, in your opinion, adopted a useful rule in making all this money to be issued by sale by auction, in order to prevent any unnecessary expenditure of capital?—Yes; there is no longer any inducement that Directors shall expend capital in anticipation of wanting it.

And it matters very little, comparatively, what the rate of dividend is?—Yes. If I were the Legislature, I should as soon sanction a Gas Company having 10 per cent. as 7 per cent., because the 10 per cent. will command a greater amount of money being paid as premium.

We now come to the question of standard price. Of course the maximum price goes out of consideration, and a standard is fixed which, under contingencies, would fairly meet the requirements, so that the Company may not lose if coal and labour rise, and if things continue at the cheapest they will not get too large a profit?—They cannot get too large a profit, because the sliding scale forms part of the Bill. They



ought to have the chance of increasing their dividends by means of increased economy.

But they cannot increase their dividend without giving a corresponding advantage to every consumer?—No; they take the consumers, as it were, into partnership.

What do you think is a fair standard price, looking to all the circumstances of the case?—I think the present price, which is 4s.

Of course this large amount of capital to be expended—which you say is necessary—will throw a greater burden upon the present Shareholders, and they must wait some time before they can expect to realize the full advantage of it?—Yes.

That will be capital, in fact, placed as a dead weight upon the Company, and tend to reduce the dividend actually increasing to their profit?—The Company can only pay maximum dividends by an increased amount of economy. The new works will enable them to manufacture gas at a less cost, and it is only by that economy that they can hope to pay the dividends they have paid on the old capital, and 7 per cent. on the new. The profits earned in the year ending June, 1877, amounted to 12-91d. per 1000 feet, and that is just about 1d. per 1000 feet more than is required to pay the dividend, which is a very small margin indeed. If they are going to spend, as they will do in the next three years, some £50,000 or £60,000, the dividend on that additional capital can only come from increased economy.

If any nuisance has arisen in times past, will what you propose to be done effectually prevent the recurrence of such nuisances in future?—What I propose to do would have the effect of converting the Exeter Gas-Works from an old-fashioned state, liable to all sorts of complaints, into a perfectly modern one, which the inhabitants of Exeter may, and no doubt will, be proud of. There will be no nuisance, and no cause of complaint, but the greatest amount of economy.

Cross-examined by Mr. SOMERSET: The Bill will benefit the ratepayers of Exeter, because, if they cannot get what they want from the old works, they will be only too thankful to get it from the new.

Mr. SOMERSET: I do not see how that benefits them, except that if they cannot get a thing now they may get it afterwards. Does it not enter into that consideration of a benefit whether they pay too much for it?

Witness: They will not pay too much for it.

They propose to raise £162,000 new capital?—£130,000 additional capital, and power to borrow the remainder.

They have spent in the last 60 years £70,000, in round figures?—Yes; and they would have been better off if they had spent £70,000 more.

[Witness handed in an "approximate estimate of expenditure of capital to meet the wants of the next seven years," amounting in the gross to £110,820, in which was included an item of £13,000 for working capital, required to enable the Company to go to market properly.]

Mr. SOMERSET: £110,000 in seven years will leave £60,000; how long do you think that will last?

Witness: About five years, according to my estimate. New works are always receiving new demands; and as the rate of increase is about 10 per cent., at the end of seven years we may expect 50 per cent. further to be added to the demands made upon the Company, and those demands must be provided for by enlarging the new works now to be built. What we have to contend with now is the absolute necessity for annihilating the works, which have grown up in what may be described as a "higgledy-piggledy" manner. I have never previously stated that the works were in a fair state, although I have never said anything hard against them.

Cross-examination continued: I made my estimate, for the purpose of this inquiry, within the last month; but I said a year ago that certain things were wanting. I made a report on the state of the works in March, 1877, but I have not referred to it since. The Directors asked me to examine the works, in consequence of complaints of a nuisance in January of that year; but nobody knows what that nuisance was.

Mr. SOMERSET: Do you know that the Magistrates found out a nuisance several times, and fined the Company?

Witness: I was not there the second time, and they did not pay much regard to me the first time.

When you were down there, did you smell anything very disagreeable?—No; nothing at all.

I will read one line of your report—"You are a credit, a comfort, and a blessing to your good old city." That was your view on March 19, 1877?—That is my view still.

And yet the whole thing is so bad that you must spend £110,000 on it at once?—These men took to gas-making in 1816; they were some of the pioneers of gas lighting, and what Exeter would have done without them I fail to discover. I advised the Company to apply to Parliament, and here they are. They could not make these works other than they were without the authority of Parliament. They have grown up piece by piece, without order or design, so far as the planting of the separate pieces is concerned.

Mr. SOMERSET read some further extracts from Mr. Spice's report, and was about to cross-examine the witness upon them, when he was interrupted by

The CHAIRMAN, who said: Do you want to show that the witness has spoken very well of these works, because, if that is your object, have you not shown it sufficiently?

Mr. SOMERSET: I will not say a word more upon that point. (To witness:) You object to the Corporation taking power to purchase?

Witness: I object to their taking compulsory powers.

Mr. SOMERSET said his learned friend, Mr. Pope, yesterday told their lordships that the Corporation were deceiving the Committee by inserting a paragraph in their petition complaining that the Bill contained no provision for the transfer of the undertaking to the Corporation upon terms to be agreed.

Witness said he would rather leave Mr. Pope to explain his own remarks, and that he did not accuse the Corporation of deception.

Cross-examination continued: I should say it is not a frequent usage for clauses of that description to be inserted; it is never done except it is forced upon Companies. This has been a prosperous concern, and the Corporation—like many other Corporations—desire to become possessed of it. I have had a working statement made out for the twelve months ending June 30, 1877. The amount of gas sold was 115,226,000 feet, and gas made 144,751,500 feet.

Mr. SOMERSET: With regard to the price of gas, you say it is perfectly immaterial whether they are allowed to raise £100,000 capital more or less; under the auction clauses it does not signify?

Witness: As to the quantity of capital they may be authorized to raise, it just depends how long any given amount of capital can carry a concern on. I conceive it would be unreasonable for Gas Companies to have the power to raise capital once for all, but that they should be limited to a reasonable amount to carry them on for 10, 12, or 15 years, because in that time improvements may be effected which will allow Gas Companies to sell gas at a lower price.

Now let us go to the standard price of 4s.; Plymouth is what?—Plymouth has been built up out of profits, and is not a parallel case at all. In that case £60,000 has been spent out of profits. They bought the concern

ment with a very large quantity of gas, the meter being put on just where the gas is delivered into the mains, and there is not any leakage; there are also four or five consumers who consume about a million feet each, but there is nothing like that at Exeter. London is vastly better situated than Exeter, but there is only a difference of 3d. between the standard price of the great Chartered Company and Exeter. The price of gas at Exeter—4s.—will compare favourably with places of the same size. The cost of gas at Exeter in the year ending June 30, 1877, was 34-17d., and the price realized—selling it at 4s. to private consumers, 3s. 9d. to the railway companies, and 3s. to the city (for which they get no thanks)—was 47-08d. The difference between the two, which is the profit, is 12-91d.; that is all the Company have to pay their dividends out of, which requires, in round numbers, 1s. on the small amount of capital at present existing. The Company must effect economies of 6-4d. per 1000 feet to enable them to pay the maximum dividend. The unaccounted-for gas amounts to 19-40 per cent. I have never known it to be 40 per cent., although it might have been so, because that has happened many times and in many places. I know that the Company have been laying a large main, and that they have been reducing the leakage for several years. I would not advise the Company to accept a Bill on a less price than 4s., because I believe the effect would be disastrous; they would not be able to raise the money, because the public would not buy the shares, and then the city would suffer. If these works are not put in hand at once, I say Exeter will be in distress for gas. The clause stating that the Company can raise their dividend 5s. for every penny reduction may come into effect in about seven years. I could not say that the rate of increase last year will be maintained year by year. The rate of increase hitherto has been only 5 per cent., but last year it was 9 per cent. If the concern is well managed, and the works are well designed, 9 per cent. may be maintained. I would not refuse the Bill if the sliding scale was refused, but I should consider that it was a refusal of common justice. Where auction clauses are imposed upon a Company, they should have some future chance of benefit, seeing they have all the risk. This Company have the risk of having to find £100,000 in a very short time, and there is an obligation resting upon them to provide for the wants of the place, and those risks should be considered, and some little allowance made in the way of a chance of something beyond 7 per cent. I believe the consumers would stand a better chance if, instead of 7 per cent., the modern rate was 10 per cent., like the old, because the 10 per cent. stock will, as a rule, command a premium of 100 per cent., instead of 40 per cent. for the 7 per cent. The lands proposed to be taken by the Company are some odd pieces belonging to the Corporation. [Witness pointed out the same on the map.] I suggested having a viaduct instead of a tramway, because it would be a means of getting coal direct from the ships without carting.

Re-examined by Mr. MICHAEL: I do not know of any capital which has been raised in London under the sliding scale at a less rate than 10 per cent., but whether it is 10 per cent. or 7 per cent. makes no difference to the consumers, seeing that it would be sold at £200 if it were 10 per cent., or £140 if it were 7 per cent., and, therefore, it would be money put into the capital of the Company in the shape of premiums, receiving no dividend whatever. In my report I stated, "Your first care should be to do what is necessary to set your house in good order, that you may give no cause of offence in any quarter," and I adhere to that statement now. It is absolutely necessary that this money should be expended for the benefit of the gas consumers; but it will throw an additional obligation upon the Company, because the dividends can only come out of increased economy and increased consumption. There are some small asphalt works on the land we propose to take, but very little more than a tar-boiler and a steam-boiler. There must be a sulphurous smell from tar-works, but, as it is, the two smells get mixed up, and we get the credit of both.

Mr. Alfred Penny, examined by Mr. MICHAEL.

I have visited the Exeter Gas-Works, and agree with Mr. Spice that they are antiquated, and require to be reconstructed. I do not think any extravagant expenditure of capital has been contemplated; but that, having regard to the natural increase that may be expected in a town like Exeter, a proper provision has been made for such a period as may elapse before they apply to Parliament again. I think the capital asked for, and the rate of dividend and expenditure in the mode proposed, will be only for the advantage of the gas consumers, because the present shareholders can receive no benefit from the emission of this new capital. In the old times, when the shares were issued *pro rata* to the existing shareholders, they naturally obtained the benefit of any premiums that the shares might command; but now the outside public come in and buy them if they think they are worth buying, and, as a rule, well-managed gas properties will produce a return which is considered fair if it gives 5 per cent. to the purchaser; and, therefore, any premium beyond that will naturally go as capital which receives no dividend, and will be, of course, to the advantages of the consumer. The tendency of the new works will be to produce gas at a cheaper rate, and to decrease the waste in every part of the manufacture. I do not think so much capital has been expended in the past as ought to have been expended in ordinarily economically conducted gas-works. When I was at the works, there were some smells which are incidental to gas-works, more or less; but I think the smells I experienced emanated just as much from the tar-works as from the gas-works. I think the price of 4s. is a fair and reasonable one to adopt. In many Bills—and in a case in which I was concerned last session—it was considered a proper thing to allow some little margin beyond the actual cost of the gas at the time. In my view, the cost of everything, except labour, is at its minimum just now. Coal, iron, and fire goods are all at the lowest price they are likely to be, and I believe the next change will be an upward one, and if so, the cost of producing gas will be greater. If the Company then raise their price, they must reduce their dividend, so that they will have the strongest inducement not to do so, because they sacrifice their own interest—that is, by the operation of the sliding scale. The price of coal in London is about 3s. or 4s. cheaper than it is in Exeter; I found in Exeter it was between 17s. and 18s., and in London it was from 13s. to 14s. Of course, the residuals find a larger market in London; and it is from the increased price that this Company may hope to get for their residuals that they would be able to pay a dividend on the increased capital they are now asking for. There would also be economy in manufacture by having special appliances, and a diminution of the loss from unaccounted-for gas. I do not know of any case in which Parliament has inserted a clause for the compulsory purchase of a gas undertaking by a corporation. I have been engaged in many cases in which works have been bought by arbitration; but it has never been done by compulsory purchase.

Cross-examined by Mr. BALFOUR BROWNE: I admit that the amount spent last year on repairs and maintenance of works was larger than is ordinarily spent for such a purpose. It was between 9d. and 10d. per 1000 feet made, whereas it should be under 6d. I account for that because they really allowed the works to get into such a state of disrepair that they found it necessary to expend more money in that particular year. I do not know what was spent during the previous year, but I assume that as a natural consequence.

Mr. Browne: If your assumption is wrong, should I be right in asserting



that they have been spending as revenue what should properly be ascribed to capital?

*Witness:* Yes; it is quite possible they may have done so.

Tell me upon what basis you have come to the conclusion that 4s. would be a proper sum to put as the standard price for gas?—Because, with the exception of that one single item, I find nothing else that I can put my finger upon that is not a charge to revenue.

You have taken the accounts as the basis of your calculation, and you have made no deduction for that one single item?—No; and I have made no addition for those consequences which might arise from an increase in the price of coal, iron, and labour.

Supposing that single item is wrong to the amount of 4d., as you make it, that would probably lead to a deduction of 4d. in the standard price?—No; under the circumstances which I have mentioned, I should make no deduction whatever, because I have to look at this as a thing not in perpetuity, but, at all events, for the next ten years; and if coal, iron, and other things rise and produce a cost of 4d. or 6d. per 1000 in addition, I then have something which will enable me to maintain my dividend.

If, on the other hand, you are wrong in supposing that these things are at the present time at the minimum, something ought to be struck off on account of that?—Yes, if I am wrong; but I am not wrong.

Cross-examination continued: I do not think it is of the least possible consequence whether the new capital be £100,000, £200,000, or £300,000, or whether they had power to raise it all at once, or a portion be deferred. I think that, if the inhabitants of Exeter knew that what capital was going to be spent would be spent with a view to economy, they would believe that the dividend would be secure, and they would give a premium such as is now given when shares are sold. I do not think the works as they are now could be carried on without a nuisance. I do not know how long they have been in their present condition, but I should judge they had been in an unsatisfactory state for a considerable period, and the Company ought to have applied to Parliament three years ago at the least.

Mr. BROWNE: Would you object to accept 4s. as the maximum price, striking out the sliding scale, instead of 4s. as the standard price with the sliding scale?

*Witness:* I should not object, if the auction clauses were withdrawn, because the capital would then be allotted *pro rata* to the existing Shareholders, and they would get the benefit of the premiums, whatever they might be. I am aware that in the Christchurch Act last year the auction clauses were left in, the sliding scale struck out, and a maximum price inserted of 7s.; but that was a very small affair.

Are you aware that in this Company's case the auction clauses have existed since 1865?—I am not aware of it; neither do I think it is so. I do not find it in their Act.

You spoke of the price of coal at Exeter, as compared with the price in London—are you aware that the cost of coal delivered at the works in Exeter is 12s., and would not that alter your judgment as to the proper standard price?—Yes; if you could tell me that 12s. is the price of the proper coal necessary to be used to produce gas of the illuminating power named in the Bill.

Take 3000 cubic feet per ton, at 14 candles?—I should require a larger quantity of gas than that to be made per ton of coal.

Mr. BROWNE referred to clause 30 of the Exeter Gas Act of 1865, providing that one-half of the capital raised under that Act was to be sold by auction.

Mr. MICHAEL: And they put the premium to the credit of the consumers instead of putting it into their own pockets.

Re-examined by Mr. MICHAEL: If a Company only had sufficient dividend to pay on £50,000, and they issued £50,000 more, there would be necessarily a reduction on the dividend that the old shares would receive; but I do not believe that any Gas Company would be so foolish as to do so. My experience tells me that the amount put down in a Company's accounts for repairs and maintenance is a very uncertain sum. In one year they may do a great deal, and in the next year nothing; the sum of £1300 was expended last year for retorts; but, as a retort lasts about two years, they would not have to make a similar expenditure in the following year. The whole cost of retorts should come into revenue. I am aware that the company have not paid maximum dividends.

Mr. MICHAEL: Therefore, if they have expended their revenue on purposes to which capital ought properly to be applied, have they not been taking profits out of their own pockets?

*Witness:* I think the fact of a larger expenditure having been made for those purposes, and paid for out of revenue, shows that they do not desire to mulct the concern to too large an extent. The necessary consequence of their operations has been to rob themselves of 2 per cent. to put the money into the works.

Mr. George Livesey, examined by Mr. POPE.

I advocated the sliding scale very strongly before Mr. Forster's Committee in the House of Commons. I have inspected the works of the Company, and agree with Mr. Penny and Mr. Spice that they may be considered as antiquated, and requiring considerable expenditure. I have no doubt whatever that immediately on the Company improving their works and mains there will be a very large increase in the demand for gas. It is perfectly certain that with inefficient works they cannot be conducted properly, and that if nuisance is to be avoided the works must be maintained in an efficient state. With an increased capital of £160,000 I should think the Company could not be expected to come to Parliament again within less than 15 years, but that would depend entirely upon the rate of increase in the consumption of gas. Assuming that with increased appliances the consumption increased at the ordinary rate, the works would be doubled and half doubled again in the 15 years. The sliding scale and the auction clauses combined make it to the interest of the Directors to expend their capital as carefully as possible. I consider 4s. to be a fair standard price. The South Metropolitan Company, I think, were treated hardly in being fixed at 3s. 6d., while all the other Companies got 3s. 9d. The price of coal would account for the difference between 4s. in Exeter and 3s. 9d. in London. Assuming the money is judiciously spent, the Shareholders must look for dividend in improved working, diminished leakage, and improved sale of residuals. A large gasholder is imperatively necessary this year; in fact, it is a matter of astonishment to me how the Engineer carried on the business last winter without putting the lights out. I noticed the asphalt-works as we drove up to the gas-works, and I thought, if they were going on, I was not at all surprised at the complaints made. I can state from my own experience that asphalt boiling is an intolerably greater nuisance than anything proceeding from gas-works. The absorption of these premises into the gas-works would therefore be an advantage. I do not want it to be thought that in my own works we ever made asphalt; but in the neighbourhood asphalt was made, and we got the credit of it. The Exeter Gas Company have not hitherto supplied the city properly, and it is absolutely necessary that they should have the power they now ask for to enable them to do it. I do not know of any instance in which Parliament has compulsorily intervened to hand over the property of Gas Companies to Corporations.

Cross-examined by Mr. SOMERSET: The South Metropolitan Company were never proceeded against for nuisance. I admit there was a nuisance at

Exeter, no doubt from inefficient apparatus. The sliding scale was imposed upon the South Metropolitan Company in 1876, previous to which our price was 3s., although we had power to charge 3s. 6d. Our price now is 3s. 2d., and our dividend 11 per cent.

Mr. SOMERSET: An immense advantage to the consumers, that!

*Witness:* It will be.

They pay 2d. more, and you get one per cent. more, and you say that is an advantage to the consumers?—The Committee were told that if they gave us the same price as the Chartered Company we would maintain the 3s. price for gas, but they would not listen to any proposals, and we thought they treated us very unfairly; therefore we took the advantage the sliding scale gave us, and raised the price to 3s. 2d. The cases of the Exeter and the South Metropolitan Companies do not run together at all. The South Metropolitan had served the consumers of London better than any other Company, and they were treated worse.

Re-examined by Mr. POPE: In our case, we were actually charging less than the standard price given us by Parliament, while in the present case the standard price asked for is the exact price charged, so that we could not ask for any more than the consumers are at present paying. The South Metropolitan Company starved their works during the bad years, and they maintained the price at 3s. all through the coal famine, when other Companies went up to 5s., and they spent as little as possible on the repairs of the works.

Mr. Penny was recalled, and examined as to the proposed alterations of the works, and the advisability of having a tramway or a viaduct for the purpose of delivering the coal into the works, the witness strongly favouring the latter view on the ground of economy and convenience.

Mr. George Henderson, examined by Mr. POPE.

I am Secretary and Manager of the Plymouth and Stonehouse Gas Company. Our Company have been quoted as being able to supply gas at a very low price, but that arises from the special circumstances of the Company, and has no reference to the power of a Company like the Exeter Gas Company to supply gas at less than 4s. At Plymouth we have a very small capital, and very exceptional consumers.

Cross-examined by Mr. SOMERSET: The price at Plymouth is 2s. 4d., and the price of coal 18s., delivered in store.

Re-examined by Mr. POPE: I should think the freight to Exeter is 1s. more than to Plymouth, on the average.

Mr. POPE said that was the case for the promoters of the Bill.

Mr. GRANVILLE SOMERSET, on behalf of the Corporation of Exeter, said the Committee knew perfectly well that the view taken by the Corporation was that the standard price asked for was too high, that they did not believe the auction clauses would have that admirable effect with regard to the consumers which the promoters stated would be the case, and that the amount of capital proposed was perfectly unnecessary. They also believed that the effect would be a very prejudicial one to the consumers, and that it would practically be the means of keeping the Company independent of Parliament, not for 10 or 12 years, as stated by Mr. Spice, but certainly for 30 or 40 years at least. His learned friend admitted that the concern had been open to very serious objections; that from carelessness or ignorance—not mischance—they had committed endless nuisances, and had been repeatedly fined; in fact, their case was, "We have not done what we ought to have done; we have not come to Parliament as we ought to have done; therefore will you grant us £160,000, because, if you do not, Exeter will never be properly supplied with gas." The answer to that was that the Company were not the people to ask for such a thing. If ever there was a case in which compulsory powers of purchase should be granted, it was the present. Who were the parties who objected to the Company being trusted further? The Corporation of Exeter, who were supported by the whole town, and who asked the Committee to prevent those large additional sums being given to a Company who had misused their powers. It was their own confession, or, more than their confession—it was their claim for their Bill that they had so misbehaved. They asked for £160,000, but they had only spent £70,000 during the last 60 years, and they had divided 10 per cent., except on two occasions, within the last ten years. The curious thing was that the famine year was one of the years when they divided 10 per cent.; and it was also put as a very great credit to them that, instead of raising money at 7 per cent., they had raised it at 5 per cent. preference; but a different class of investors put their money into shares of that kind from those who invested in ordinary shares. The question then arose, was it or was it not for the public advantage of Exeter that the Company should go on with their works, or should they be handed over to the Corporation. If the Committee refused the Bill, the result would be that the parties would come to terms, and the Company would obtain a proper price. If, on the other hand, their lordships thought it for the public advantage that the gas supply of Exeter should be retained by these gentlemen for 40 or 50 years, was it necessary to raise £110,000 first of all, and £60,000 afterwards? Mr. Spice said they must make it a new concern—a new building altogether—everything was bad, and must be renewed at once; and yet he spread the expenditure over seven years. Mr. Spice stated that from the £110,000 must be deducted a considerable sum for works already executed (the capital for which had been temporarily advanced), amount owing to reserve-fund and expended on capital account, working capital, &c., making something like £32,000, which left about £82,000; but he (Mr. Somerset) submitted those were not items for which the Company ought to have fresh capital allowed to them. What was to be done with the other £82,000? Mr. Spice said it would be wanted during the succeeding five years. Why, everything was to be made perfect by the end of seven years by his own time and his own figures, and then it required £12,000 a year to be spent for the next five years. Mr. Spice was asked if he could give any reason, but he said he could not; and surely it was not to be expected that the Committee were to be asked to pass a Bill imposing a payment upon the gas consumers of Exeter of £160,000, and yet for that gentleman to say he had no reasons to give. It was said that it was perfectly immaterial whether £100,000 or £1,000,000 were raised, because they had the auction clauses; but was that so? There was great safety in that argument, because there had been no experience of them. What were these auction clauses? First of all, auction clauses or no auction clauses, £130,000 of new capital had to be raised at 7 per cent., and £32,000 at, say, 5 per cent. That came upon the gas consumers of Exeter as £9100 per annum on the ordinary shares, and something like £1500 upon the preference shares, and till that was paid there could be no reduction of price. If they obtained the premiums and so forth there would be a much larger sum than £160,000 to lay out; it might be £200,000, because the premiums were to be applied in improving the works and so forth before the Company need apply to Parliament again. The section in the Bill providing that no single lot should comprise more than £100 nominal value of shares or stock, read very well, but many ingenious schemes might be devised whereby large shareholders with £40,000 or £50,000 in their pockets, might get most of the shares at their own price, or, at any rate, at very nearly par, and not at a premium. With regard to the standard price, the Committee knew how constantly it was insisted upon that when a Company had reached their maximum dividend, they were bound under the general Act to reduce their price; but that was one of the things the standard



price did away with. What chance was there of the gas being reduced in price unless the Company saw their way to make an additional profit of 2, 3, or 4 per cent.? Mr. Spice said that 4s. should be the standard price, and he should not advise the Company to take less. Advice to the Company was one thing, but advice to the Committee was another. He (Mr. Somerset) submitted to their lordships that a reason ought to have been given. He tried to get that reason, and Mr. Spice said there would be a shilling left for dividend, but no other reason could be obtained. Taking Plymouth as an example, with a price of 2s. 4d., and supposing gas to be supplied to Exeter at 2s. 6d., or 2d. more, they ought to pay their 7 and their 10 per cent. dividends if the Committee gave them a standard price of 8s., and have a good 6d. to spare. But if they were allowed 4s., it would be just 1s. 6d. more than they ought, according to the practice of Parliament, to charge. The Committee knew that if the Company reduced the price of gas 4d. they might pay 1 per cent. more dividend. For 1s. reduction, they might be able to pay themselves 3 per cent. more, and therefore supposing the Bill passed, and those calculations were correct, the Company would be in the happy position of paying to themselves upon the ordinary shares at present existing of £40,000, 13 per cent., and upon the shares which they sought under the present Bill—that was £130,000—10 per cent. out of the pockets of the consumers. Supposing those calculations were wrong, and they had 6d. instead of 1s., still that would be a very happy position of things, because then they would pay 11½ and 8½ per cent. Although there was no strictly analogous case, surely there must be in Mr. Spice's experience some town in England like Exeter—something that he might have given to the Committee as a guide—but he said he could not find a parallel case anywhere. There certainly must be a ground of complaint if a gentleman came with such a case as that without being prepared to give reasons. There was another point to which the Corporation had a very serious objection, and that was with regard to the viaduct; but if their lordships would only reject the Bill, that question need not be entered into. In conclusion, he (Mr. Somerset) said that people who, by their own showing, admitted that they had not done anything which they ought to have done, and had done what they ought not to have done, should not be entrusted with further powers, and he would therefore leave the case in their lordships hands.

Mr. George Hirtzell, examined by Mr. BALFOUR-BROWNE. I am a solicitor, and have practised in Exeter for the last 20 years. I am a member of the Town Council, and was engaged in 1865 in promoting a Bill in Parliament for the incorporation of the Exeter Gas Consumers Company. The occasion of the promotion of that Bill was the same as now—viz., the impurity of the gas, the want of quantity, and the way in which the Company dealt with the city. The capital of that Company was £30,000—6000 shares of £5 each, and about half was subscribed. About 9000 ratepayers signed a petition in favour of the Bill, and we had promises of consumers paying to the old Company about £500 a year. I thought at that time there was room for two Companies in Exeter, and that opinion was borne out by evidence presented to the House. A compromise was, however, arrived at, the old Company agreeing to adopt our scale of charge, and to be under certain restrictions; clauses were also agreed upon for testing the gas, and so on, and the illuminating power was increased. The Company had in addition to pay our costs. A clause was likewise inserted that the gas should be tested at the Company's works, but we do not think that has practically been of any value to the consumers in Exeter. We think that the testing ought to be at some part of the town where the gas is actually consumed. There was a Company started in 1851, but I believe it did not go very far. I am told there was another in 1836, but I think the old Company subsequently bought both up. There have been great complaints since 1865, principally of want of pressure; and on various occasions complaints have been made that ordinary atmospheric air has been driven through the pipes with the gas. I believe sulphuretted hydrogen was once to a large extent supplied. There have frequently been offensive smells issuing from the works, and the houses in Colleton Crescent have very much decreased in value in consequence. The smells are like very bad rotten eggs. I once had an idea of purchasing a house in the vicinity of the works, but the smell was so bad I would not have anything to do with it. As a member of the Town Council, I object to the great increase of capital the Company seek to authorize under this Bill. I believe that the Council would be willing to treat with the Company upon fair terms for their present works, but I think that the authorization of this large amount of capital will throw difficulties in the way of any such agreement. In my opinion, the amount sought for is unnecessary for the work to be done, but I am not an engineer. I think if the Company manufacture residual products and tar on the works we shall always have the smells, because the prevailing winds blow in that direction.

Cross-examined by Mr. PITT LEWIS: I have been informed—although I do not know—that atmospheric air produces a great blueness in the flame, and we have constantly observed that. I cannot say whether the Gas Inspector has ever reported the gas; but I know we complain in our own houses. I think the Gas Inspector tests once a fortnight. I think the smells ought to be remedied, and this the Engineer says must be by an entire remodelling of the works. No doubt this would be an expensive process, and that has been so reported to the Town Council. I have heard what Mr. Livesey said about the asphalt-works, but I never knew until to-day that they caused a nuisance. My chief objection to the capital asked for is, that I have not the slightest doubt that, at some future time, the Council will have to buy the works. If the Engineer on our side says it is too much, we shall have to pay so much, if we buy them upon this capital.

Mr. LEWIS: Are you aware, if you had to buy, you would not buy on the capital, but on the basis of the dividend?

Witness: Pardon me; I think you are mistaken. We have just bought the water-works.

Assuming that the basis on which the Town Council would have to purchase is the dividend earned, your objection would then be removed?—I say that, if they expend so large a sum as you ask for, and they are authorized to pay on it a dividend of 7 per cent., they will, when we come to buy, ask that we shall pay them so many years purchase on the 7 per cent. dividend. I am assuming that you will spend the money and pay the dividend on it.

If we spend the money and pay the dividend on it, the expenditure will be necessary, will it not?—There are many ways of dealing with capital besides laying it out on the works.

Re-examined by Mr. SOMERSET: If we bought now we should have to buy upon a dividend of, say, £5000 a year; but if this Bill passes, we should have to buy upon a dividend of about £16,000 a year. I do not see any objection to a man making as much as he can out of what he is honestly entitled to; but, at the same time, it is not so pleasant to pay. I never heard of the asphalt gentlemen being summoned. It is a very difficult thing to obtain a conviction at all, but at last we succeeded.

Mr. George Wilson Stevenson, examined by Mr. SOMERSET. I have been down to Exeter and examined the works, which could not be in a worse state than when I inspected them. I think the capital proposed is a great deal too much to be granted at one application, as I think it is advisable that Gas Companies should be compelled to come to

Parliament every 10 or 12 years; whereas I should think this capital would last the Company from 20 to 30 years. I should think £100,000 is the extreme which should have been asked for. I mean £100,000 of share capital; because, if offered under proper conditions at public auction, that would realize £140,000, supposing it to bear 7 per cent. dividend. I would give them borrowing powers not to exceed 5 per cent.; but I would exclude the power to create preference stock, or to issue preference shares, because they would have a dividend of 6 per cent.—or, perhaps, 5 per cent.—upon preference stock, which the Proprietors would allot amongst themselves. The object of the auction clauses is as much as possible to bring new blood into the concern, and to give the public an opportunity of investing their money. The proviso by which they are limited to offering £50,000 worth of shares, nominal value, in one year, is very well; but I think they ought to be limited to offering not more than £10,000 worth of shares in three months, because they might put the whole £50,000 in the market at one auction, and the consequence would be that the market would be glutted, and the present Proprietors, who alone would know the value of the stock, would buy it up. There is a further clause in the Bill which provides that if the shares offered at public auction be not sold at the time, the shares are to be offered to the Proprietors, under the Companies Clauses Act, so that the direct effect of flooding the market would be to bring into operation the provisions of that Act. I would strike out from the Bill everything relating to the purchase of shares by tender, because it is a semi-private sort of way of disposing of the shares; and I think it is a good thing that the actual value of property of this kind should be known by the public, and that the public should have an opportunity of investing their money in it.

The CHAIRMAN inquired whether the auction clauses were not ordinary clauses.

Mr. MICHAEL said they were, and had been settled by Lord Redesdale.

Mr. SOMERSET: That is to say, they are admitted into the Bill for the consideration of your lordships.

Witness said they only became general last year, and there was a Standing Order of the Commons last session that the shares of an established Gas Company should be offered at public auction, unless the Committee otherwise decided, and gave their reasons.

Mr. SOMERSET: It is not at all impossible that when the ingenuity of gentlemen has been turned to this, they may have to be altered next year?

Witness: They have been altered already in this respect, that when first brought out these clauses had no limitation as to the number of shares that might be offered at one auction, so that £50,000, or the whole of the capital, might be offered in one lot, which would, of course, have destroyed the intended effect of the clause.

Mr. MICHAEL: Not in this Bill?

Witness: No.

Mr. SOMERSET: And the proviso about the £100 in one lot is to meet that difficulty?

Witness: Yes.

Examination continued: I consider the standard price of 4s., as inserted in the Bill, to be 6d. too high. The accounts show that 2s. 10d. per 1000 feet was the actual cost last year of the gas at the consumers' meters; the sum required for dividend is 1s. and a fraction of a penny, and 2s. 10d. and 1s. put together are 3s. 10d. What they charged for repairs and maintenance of works last year was excessive—very much beyond what would be required in an ordinary state of things; there ought to be 4d. per 1000 feet taken off for that item alone, and 4d. from 3s. 10d. leaves 3s. 6d. as the standard price. I quite admit that the Company may have been under the necessity last year of spending this large sum of 9d. per 1000 feet upon repairs and maintenance, because their works were in a very bad state; but the average should be taken of a series of years, in order to ascertain the proper expenditure under that head, and, consequently, the proper standard price. Mr. Penny said he would not take off the 4d., but I think he ought to have done so. The testing-place for Exeter ought to be in the centre of the city, where the consumption goes on—at the Guildhall, in the centre of the High Street, or anywhere about there, which would be from half to three-quarters of a mile from the works. There is a great variety of opinion whether gas does lose in illuminating power at all from transmission through pipes. I heard it stated a fortnight ago that the gas actually gained by being sent through miles of pipes, but, of course, I do not believe that. The practice in the Metropolis is to test it at least 1000 yards from the works.

Mr. MICHAEL said that, if it was desired that the testing-place should be in the centre of the town, the Company would be most happy to assent.

Examination resumed: As to the illuminating power, if the Company retain their present standard burner, I should say they ought to keep their standard at 14 candles; but if they adopt a standard burner for measuring the illuminating power, which gives them nearly two candles better light, as they are proposing to do, they ought to put on two candles extra, and make it 16.

Cross-examined by Mr. MICHAEL: I believe the burner prescribed by the Act of 1865 was a 15-hole Argand, with a 7-inch chimney; but the present Bill prescribes Sugg's "London" Argand burner, No. 1, with a 6-inch by 1½-inch glass chimney, and that burner has 30 holes. It is the burner prescribed by the London Referees, but for 16-candle gas, and I should, as an engineer, use a different burner to test a 16-candle gas than for a 14-candle gas.

Mr. MICHAEL: Do you mean to say there are burners employed over the country of a different character for each single candle?

Witness: No; not over the country, but by Mr. Sugg. He makes a different burner for every candle of illuminating power, and shows an appreciable difference between the illuminating power by each burner.

But whenever the power is 14 candles, is not that the test used?—I believe it is, generally.

Supposing 3s. 6d. were adopted as the standard price, according to the accounts upon which you base that, this is the very cheapest time for the manufacture of gas?—It is at a cheap time; but I have known coal a little lower than it is now. I cannot tell whether it is going to continue as low.

Supposing it were to increase, could gas then be supplied at 3s. 6d., and pay maximum dividends?—Not if it increases much, except by care, and skill, and management.

Are you aware, supposing 3s. 6d. were adopted, that there is an obligation on the Company to supply gas to the public lights at 3s.?—Yes; I think a very improper obligation.

Is there any clause proposed by the Company to get rid of that obligation?—I am not aware that there is, but I think it is extremely improper that the ratepayers should receive the benefit at the expense of the consumers of gas. I have always said that the public lamps ought to be supplied at the lowest price charged to any private consumer.

I do not now at all disagree with you on the justice of the matter, but the fact is, as at present constituted, the Company are bound to supply at 3s. If 3s. 6d. is the price, then the price which would be realized by the Company would be something between 3s. and 3s. 6d.—I do not know that. You put in a working statement of the cost of gas, and from that I ascertain that the whole of the gas is supplied at 2s. 10d. per 1000 feet.



But that is the cost; that has nothing to do with the money realized?—  
I do not suppose it has.

Then why do you answer my question by something diverse from it?  
When a part of the gas only realizes 3s., and the other part 3s. 6d.—and  
3s. 6d., according to your account, is required to pay the dividend—can  
the dividend be paid when a less sum is realized than 3s. 6d. over the  
whole?—No.

Can you tell the Committee of any one case, since the establishment of  
the sliding scale, in which Parliament have fixed a lower price than the  
price absolutely charged at the time?—Yes. It was fixed at a considerably  
lower rate in the case of Ashton-under-Lyne last year. I believe the  
standard price was fixed at 3s. 8d. I do not remember the price previously  
charged, but it was not 3s.

Can you conceive any way where the intention to sell is made so  
public, and such limitations are placed upon the Company, by which it is  
possible for the Company, as against the consumers, to acquire that capital  
without having the whole amount of the premiums to put into the concern?  
—If the sections are honestly worked, the result will be that the  
premiums will come in with the shares, and these will go to the extension  
of the works without bearing dividend.

Therefore, if there is to be any disadvantage it must be by dishonesty?  
—Ingenuity; “dishonesty” is rather a bad expression.

Re-examined by Mr. BROWNE: Would “financing” do it?

Witness: There are crooked ways in which even Acts of Parliament  
may be avoided.

You say that Mr. Sugg has a different burner to test every gas that is  
different in illuminating power?—Yes; I have myself 30 or 40 burners  
applicable to different qualities of gas.

If this Committee fix 3s. 6d. as the standard price, do you think it is  
possible that, with care and skill, the Company may be in a position to  
some future time to increase their dividend?—I am quite certain they  
would. Mr. Padfield said yesterday that the Company sacrificed £1500 a  
year by their contract on ammoniacal liquor; and if they take the manu-  
facture of the products of ammonia into their own hands, they will increase  
their income by this £1500 a year. Their leakage is now nearly 20 per  
cent., and that ought to be reduced to 7 or 8 per cent. in a place like  
Exeter.

The object of the sliding scale is to necessitate that care and skill  
which have not hitherto been brought to bear on these works?—Yes; and  
I think it will have the effect of compelling the Company to do what is  
necessary to their works. They have shown an extreme indisposition to  
spend money when the expenditure of it would have been really of  
advantage to themselves.

I suppose if too high a standard price were fixed it is merely giving a  
bonus to the Shareholders at the expense of the consumers?—That is  
obviously so.

Do you think they could afford to charge so low a sum as 3s. 6d. if they  
continue to charge 3s. for the public lights?—No; I mean 3s. 6d. all  
round. I think the exceptional contract in favour of the public lighting  
is an improper one; but that contract will come to an end some time, and  
then, if anything beyond 3s. 6d. were fixed, the Company would get an  
advantage incidental itself to the termination of that contract.

Mr. Thomas B. Purnell, examined by Mr. BALFOUR-BROWNE.

I am a coal merchant carrying on business in Exeter. From my experience  
I think I could supply the Exeter Gas Company with coal to  
produce 10,000 feet of 14-candle gas at 16s. 3d. per ton, delivered on the  
works—that is taking the present prices. I even think I could supply  
them with New Pelton coal at a cheaper rate. I chartered a vessel on  
Monday for that very coal, and this morning I received a message to say  
that for such large quantities they would be prepared to take less. I think  
the Weatherhead coal could be supplied at 12s. in the works; but I could  
not say positively, as one merchant in Exeter has the monopoly of it.  
There is a difference of about 6d. per ton in the supply of the same coals at  
Plymouth, which would be a fraction over a halfpenny in the cost of each  
1000 feet of gas.

Cross-examined by Mr. PITT LEWIS: I have had no experience in gas-  
making; but I have supplied New Pelton coal to Taunton, and I have the  
Gas Manager's authority for stating the illuminating power. Freights  
are very low now—46 5s.—about the same as they were before the coal  
famine. I do not think it is likely that coal will go up so high again, for  
the simple reason that there are such a number of new collieries springing  
up. I am not aware that the Company all last year paid 17s. 3d. per ton,  
but it is very likely, as I paid a little more myself.

Mr. Henry P. Boulnois, examined by Mr. BALFOUR-BROWNE.

I am City Surveyor to Exeter, in which capacity I have had many com-  
plaints of smells arising from the gas-works. On many occasions I made  
a point of tracing those smells to the works, and I have no doubt whatever  
the nuisance arose from that source. In my opinion the viaduct proposed  
to be made by the Company would interfere with the export of timber  
from the quay; a tramway would be better for the Corporation, and as  
good for the Company. One piece of land proposed to be taken by the  
Company, it would be very objectionable for the Corporation to part with,  
because it would limit the export trade of the future.

Cross-examined by Mr. PITT LEWIS: There would be no engineering  
difficulty in throwing the viaduct across the road with a single span.

Mr. Stevenson was recalled, and in answer to Mr. BALFOUR-BROWNE, said  
that, according to the working statement prepared by Mr. Spice, the  
private consumption was first given at 4s. and at 3s. 9d. The public  
consumption was 15,696,000 feet, and 99,530,000 feet was the private con-  
sumption. A difference of 6d. per 1000 feet on the public lamp consump-  
tion amounted to £392 a year, and 1d. on the private sale was equal to £415,  
so that 1d. per 1000 feet on the gas sold to the private consumers a little  
more than covered the 6d. difference between the price charged to the  
public lamps and that charged to private consumers.

Mr. Bartholomew C. Gidley, examined by Mr. BALFOUR-BROWNE.

I am Town Clerk to the city of Exeter, and at one time was Mayor of  
the city. As Town Clerk my attention has frequently been called to the  
nuisance occasioned by the gas-works. Complaints were made that the  
gas caused an irritation of the eyes, and that the light was poor. The  
testing clause introduced into the Act of 1865 has been simply illusory,  
and no protection to the public. There have been three prosecutions  
against the Company under the Public Health Act for nuisance under the  
terms of section 114. They have also been proceeded against once under the  
testing clause of their Act of 1865. With regard to the prosecutions under  
the Public Health Act, the first was abortive. The Council decided to  
call no scientific witnesses, and they simply produced a number of persons  
who had suffered annoyance from the stench, and who conceived that  
they had satisfactorily traced it to the works; but some of the witnesses  
were most particular in fixing a special chimney on the works as the  
source of the nuisance; and as the Company satisfactorily showed the  
Justices that no stench could possibly emanate from that chimney, they  
decided that the case against the Company had not been established, and  
the summons was dismissed. On the other two occasions the Company  
were in each instance convicted, being fined, on the first occasion, 45s., and  
on the second, £10; and they did not appeal against those convictions.

I have been over the works once, and, so far as I was able to judge, they  
were then in a very unsatisfactory condition. I examined the asphalt-  
works on two occasions, and there was certainly no annoyance whatever  
while I was there. Their process is merely a simmering of tar—it never  
reaches a boiling point—and then it is worked up with ashes or clinkers  
to manufacture a kind of tar pavement or asphalt. In my examination  
I was accompanied by other persons. We discovered defects in the  
scrubbers, and complained to the Company. Since then new scrubbers  
have been erected. The Corporation object to the increase of capital  
proposed by this Bill, because they believe that the necessity for so large  
a capital must cause the maintenance of a high price for the gas. There  
has been a growing feeling for some years that the gas supply should be  
in the hands of the Sanitary Authority, and the Council would be willing  
to treat with the Company; but the passing of this Bill would make any  
such negotiations more difficult. The Corporation do not desire to part  
with the land which the Gas Company wish to acquire. The contract for  
lighting the public lamps is terminable any Michaelmas by giving three  
months notice.

Cross-examined by Mr. PITT LEWIS: The public lamps are supplied at  
so much per lamp, based upon a calculation of 3s. per 1000 feet. The  
Company cannot get rid of that 3s. price by a three months notice, because  
it is the price stated in the Act of 1865.

By the CHAIRMAN: By section 38 of their Act of 1865, the Company are  
to supply gas at the lowest price at which they charge any private con-  
sumer, provided that that price should never exceed 8s. per 1000 feet.

Cross-examination resumed: It has been clearly ascertained how much  
each lamp burns, the quantity having been tested by means of a meter.  
The Surveyor worked out the figures very carefully some time since,  
and he told me that it came out exactly 3s. per 1000. The gas was  
tested in several parts of the city to obtain the average. Negotiations  
for the purchase of the works went on for two or three years, and last  
summer terms were practically agreed upon, but the Council were scared  
by the electric candle. Alderman Follett made an eloquent speech in the  
Council, and moved a resolution—“That, in view of other inventions for  
the supply of light, it is inadvisable to continue any negotiations for  
the purchase of the property of the Gas Company.” The negotiations  
were then, of course, broken off; but the Council have considered the  
matter this morning with a view to our position, and they have recovered  
from the temporary panic under which they passed that resolution.

By the CHAIRMAN: The Council have come to a resolution authorizing  
the Sub-Committee, who are here in charge of the opposition, to treat with  
the Company if they desire to do so.

Cross-examination resumed: There must undoubtedly be a considerable  
expenditure upon the gas-works.

Re-examined by Mr. BALFOUR-BROWNE: Looking at the difference of  
modern legislation, I cannot disguise from myself the fact that before  
many years are over these works will be in the hands of the Corporation;  
and I think it would be for the advantage of all parties—the consumers,  
the Corporation, and the ratepayers generally—that the heaviest sum that  
must be laid out on those works should be laid out under the control of  
the parties who will ultimately possess the works.

Mr. BALFOUR-BROWNE said that was the case for the Corporation of  
Exeter against the Bill.

Mr. MICHAEL, in replying upon the whole case, said there were but  
three points to which he wished to direct their lordships attention. The  
first and most important was, What was the amount of capital which, in  
the interest of the consumers—putting the Company out of the question  
altogether—ought to be expended? The ratepayers were amply protected  
by the Gas-Works Clauses Act of 1871, which, while it gave some small  
boon to the Gas Company in the way of enabling them to recover debts,  
and settled some matters as to security for gas-rents and things of that  
kind, was in reality an Act providing that gas of good illuminating power,  
and of sufficient pressure and purity, should be supplied within the limits  
of the gas undertaking. It, moreover, gave every consumer, for the first  
time, an opportunity of obliging the Company to supply gas within  
specified limits; and, therefore, by the Bill now before their lordships, if  
passed into law, there would be additional securities given to the con-  
sumers which they never before enjoyed. With respect to public lights,  
the Act also provided that if any difficulty arose, the point in dispute  
should be settled by arbitration, and the present Bill did not propose to  
alter that, which was a great benefit. He (Mr. Michael) quite agreed with  
Mr. Stevenson, that it was unjust to the gas consumers that the interest  
of the ratepayers should be considered, and a rate charged for the public  
lamps in diminution of that which the consumers paid who took the  
largest quantity. However, that did obtain in the present case; the Town  
Council, although anxious to protect the consumers, were quite ready to  
protect the interests of the ratepayers, and they did not ask that the  
differential rate should be removed. It was, therefore, an important  
question to be considered, when they had to look at the question of the  
standard price to be inserted in any Bill, in order to protect the Company  
and the consumers.

The CHAIRMAN remarked that the differential rate was settled under the  
private Act of 1865.

Mr. MICHAEL said that was so. The Company were obliged to supply  
at 3s., and they did not ask to be relieved from that obligation. Indeed,  
it did not much matter; it was a question which did not affect the Com-  
pany, but affected the consumers and the regulations existing for gas  
supply up to the reception of the maximum dividend; and beyond that the  
Gas Company were in reality made to stand in the position of trustees  
for the consumers. Then they came to the auction clauses and the sliding  
scale. It was alleged that the expenditure of capital by Gas Companies,  
being subject to no restriction whatever, when a Gas Company were in a  
position to pay maximum dividends, and have a profit beyond, which  
they could not divide amongst their shareholders, there was an inducement  
to expend capital which might be unnecessary, in order that the profit  
beyond the maximum dividend, which the capital earned, should be  
distributed, although the capital was not necessarily required for the  
undertaking. That was really the reason which induced Parliament last  
year to adopt the Standing Order requiring that all capital in future  
should be raised under the operations of auction clauses. With regard to  
the Exeter Gas Company, they had, no doubt, acted wrongly and foolishly  
in not applying to Parliament earlier, but who had been damaged by that  
but the Shareholders? Supposing the Company, as they should have  
done, had applied to Parliament four or five years ago, they would have  
obtained additional capital of £100,000, upon which the dividend, accord-  
ing to the rate then prevailing, would have been 7½ per cent. The absolute  
value of money in gas undertakings now ranged from 4½ to 5 per  
cent., so that the Shareholders had in reality lost 2½ per cent. through  
waiting till 1878 before making their application for increased capital to  
meet the growing requirements on the part of the consumers. Therefore,  
when it was said that a large amount of money had been expended year  
by year for the purpose of preventing depreciation of the works—that was  
maintenance of structures and keeping in repair the various portions of the  
works—that had come out of the pockets, not of the consumers, but of the  
Shareholders, and the consumers had had gas much cheaper on that  
account, because the capital paying dividend did not really represent the



capital earning that dividend. The Company now asked their lordships for a sum of money which Mr. Stevenson acknowledged to be necessary, because it made little difference whether the Committee gave £133,000 which Mr. Stevenson fixed—viz., £100,000 and the usual borrowing powers—or the sum now asked for. The only thing which would enure to the disadvantage of the Company was that if the smaller sum were granted, a shorter time would elapse before the Company again applied to Parliament for further powers, and that really meant embarrassing the Company with the expense of a further contest. They made their present application at the behest of the Corporation, in order to have more modern works; and, in order to make gas cheaper and better in future, they were called upon to imperil the dividend they now had by the expenditure of money which might not bring in a proper dividend. They were at the present time in the best condition for making gas; it was a cheap time for coal, and so on, but a time might come when an increased price for labour and for coal would make the production of gas dearer, and what would be the result? The Company would be burdened with additional capital, on which they would only be able to pay dividend by the greatest economy, and therefore it would be better for them to remain without the expenditure of a single farthing. But they had pledged themselves that that sum should be expended, and they would be obliged to fulfil their obligations, and remodel the works in the interest of the consumers. Whatever money was expended could do no good to the Shareholders, while it would tend to the production of cheaper gas, because all the money to be raised in future could only be raised at 5 per cent. His learned friend said that it was possible some private information could be given to the Shareholders, and that they would come with money in their pockets and buy up the whole £50,000; but, by the 10th section, the greatest publicity was obliged to be given, not merely in the locality itself, but the intention must be communicated to the Secretary of the London Stock Exchange at least 28 days before the time of auction or of tender, besides giving public notice in the newspapers for 28 days. Moreover, having regard to a way by which Gas Companies might possibly have managed to evade those provisions, they were obliged within three months to call up the whole of their share capital, and therefore there was no possibility of loophole on the part of the Company by which the public could be in any way damaged. He (Mr. Michael) would now consider the second matter, which was really the *crux* of the whole case. What was the standard price which ought to be fixed? Was it right that the Company should be cut down to 3s. 6d., a price which, according to the evidence of Mr. Stevenson himself, would not be sufficient to pay the maximum dividend on the old capital? If that price were fixed, it was quite clear that where a portion of the supply only realized 3s., the total must be less than 3s. 6d., and more than 3s. Looking at the matter in another way, supposing 3s. 6d. were proper for to-day, the whole of the new capital had its dividend to be provided for. The Company were going to spend, in the next seven years, £100,000 in the interests of the consumers, and unless they could make gas cheaper, the whole of that £100,000 was left without one penny of dividend, because at the present time, at the price of 4s., they had not sufficient to pay 10 per cent., and they had not had sufficient in times past. Their lordships would consider there ought to be some margin, and the Company asked but a very small one beyond the absolute price at which gas was supplied; and they asked that the Committee would fix such a price as would, in all contingencies, ensure to them that moderate sum, and that would not have to suffer because the needs of the city called upon them to spend new capital. The last point was, Ought the Town Council, under these or any circumstances, to call upon the Company compulsorily to part with their undertaking—not by agreement, not for a fair price fixed by the parties, but, after having had to endure the whole of the enormous expense of arbitration, to be subject to a compulsory parting with their own property? There had been no single case in which Parliament had sanctioned such a proceeding. They had been willing in time past to part with their undertaking upon a fair agreement. They were willing to insert a clause agreeing to part with their undertaking upon fair and equitable terms; they were willing at any future time to enter into a treaty with the Corporation; but they did object to the Corporation being able to come upon the undertaking at a time when the Company were at their worst, and that they might be liable to be called upon to part with their property at a price ruinous to the Shareholders, because it was not the capital which regulated the price to be paid—it was the sum calculated upon so many years purchase of the profits earned. What was the history of the matter? The Company were endeavouring to carry on their works at the smallest cost; the Council desired to possess that undertaking; an agreement was arrived at between the parties; the agreement was suddenly broken off by one of the parties because they thought that the electric candle would render unnecessary the supply of gas. Had the Town Council done anything to entitle them to ask for exceptional legislation to possess themselves of the gas undertaking? Their lordships were asked to protect the Shareholders who had invested their money on the faith of a parliamentary guarantee; they had invested it because Parliament had said, "You shall have this undertaking so long as you conduct yourselves properly." That was the undertaking, and a *quasi* monopoly of the supply. When they had had an opportunity of deriving large profits from the sale of shares, they had not put that money into their own pockets, but had sold the shares and put the premiums derived from such sale into the undertaking, which had enured to the advantage of the consumers. Upon the merits of the case, and upon all antecedent legislation, he (Mr. Michael) was entitled to ask their lordships not to insert a compulsory clause depriving the Company of their property; but he asked the Committee to pass the Bill, because it would enure equally to the benefit of the ratepayers and the consumers of the city of Exeter.

The Committee-room was then cleared. After a short time the parties were called in, and

The CHAIRMAN said the Committee were prepared to pass the preamble of the Bill on the understanding that the capital to be raised was reduced to £100,000, with borrowing powers in addition; and that in clause 5 such arrangements were made as would prevent the whole of the £50,000 from being thrown into the market at once, but that it should be divided into four or five portions. The Company would also be required to have a testing-station at a convenient place, in the centre of the town, to be agreed upon. The standard price would be allowed to remain unchanged, on account of the low price charged for the public lights.

THURSDAY, MARCH 7.

The clauses were read and agreed to, with amendments, and the Chairman was directed to report the Bill to the House.

#### HOUSE OF COMMONS COMMITTEE.

TUESDAY, MARCH 5.

(Before Mr. PEASE, Chairman; Mr. CARPENTER GARNIER, Mr. W. E. DENISON, and Mr. BIGGAR.)

#### BANGOR LOCAL BOARD BILL. BANGOR WATER AND GAS BILL.

Mr. CRIPPS, Q.C., Mr. RICHARDS, Q.C., and Mr. O'HARA appeared for the Local Board; Mr. POPE, Q.C., Mr. MICHAEL, and Mr. CHANDOS LEIGH for the Water and Gas Company.

Mr. CRIPPS, on the assembling of the Committee, applied for a short adjournment, as there was, he said, every prospect of an arrangement being come to between the parties.

The CHAIRMAN said that, after taking the appearances on the Bills, the Committee were willing to adjourn to the following Friday.

The petitions against the Bills having been read,

Mr. CRIPPS said he was able to announce that an agreement had been come to, the terms of which, however, he was not in a position to state. He thought the proper course would be to call a witness formally to prove the preamble of the Local Board Bill, so that the Committee could report it to the House, and adjourn the discussion of the clauses. The Company's Bill would, of course, be withdrawn.

Mr. Henry Barber was then called, and, examined by Mr. CRIPPS, said: I am Solicitor for the Local Board in the promotion of their Bill. I have read the preamble of the Bill, and think it would be to the advantage of the town of Bangor if the works of the Company were handed over to, and managed by, the Local Board.

By the CHAIRMAN: There is a considerable majority of the Board in favour of the transfer. The Board, I may say, are almost unanimous. If there was any dissent, it was confined to one member. There are nine members on the Board. The terms of purchase have been approved by the advising Engineers for the Board.

Mr. CHANDOS LEIGH having announced the withdrawal of the Company's Bill,

The CHAIRMAN declared the preamble of the Local Board Bill proved, and adjourned the consideration of the clauses till the following Friday.

FRIDAY, MARCH 8.

On the assembling of the Committee this morning,

Mr. MICHAEL said he had, on behalf of the Company, to appeal to the Committee to vary the agreement which had been come to on Tuesday, on the ground that he had misunderstood his instructions. The terms then come to were ordinary terms. They were that the Local Board should pay in perpetual annuities the maximum dividend to which the Company were entitled; that all debts and assets of the Company should be taken over by the Local Board as from the 1st of January last; and that the Local Board should pay the expenses of the Company in promoting their Bill in Parliament, and in opposing that of the Local Board. The expenses had been fixed at £800, and it was agreed that the Local Board should elect whether they would continue to employ Mr. White, the Manager of the Company, or pay to him, in lieu thereof, such sum as compensation as might be fixed. The learned Counsel went on to explain that, in fixing £800 as the amount of the costs to be paid by the Local Board to the Company, he had exceeded his instructions. The difficulty was that the costs of the Company exceeded the £800, and as the assets of the Company were taken over by the Board as from the 1st of January last, there was no fund out of which to pay the balance of the expenses. The understanding of the Company with the Board was that all the parliamentary expenses of the Company should be paid by the Board, and £800 was fixed in the belief that this sum would cover the entire expense. He had gone beyond his powers in agreeing to £800, and now appealed to the Committee for assistance.

Mr. RICHARDS said that whilst regretting the difficulty in which the Company found themselves, he must oppose any alteration being made in the agreement, which had been come to deliberately, and after constant references between Counsel and their clients. Clauses had been prepared to carry out the agreement come to, and he asked that it should not now be in any way varied.

Mr. MICHAEL said if the Company insisted upon it, having misunderstood his own powers, he must apply to have their Bill re-committed. He did not share in the opinions of his clients, for he believed that the arrangement carried out their instructions to him. The difficulty could be met if the Local Board would consent to alter the date of the transfer to the 1st of January in next year, as this would enable the Company to pay the balance, which would not exceed £500, out of current profits.

Mr. RICHARDS maintained that Counsel had absolute power to settle, and quoted cases in which the power of Counsel to settle for client had been upheld, and in one case the client was not even present. In this case an arrangement was come to on the Tuesday, and it was not until Thursday that any opposition was announced. It was impossible for him to consent to a revision of the terms of that arrangement, as most of the members of the Local Board had returned to Bangor. The arrangement as to costs was come to deliberately, and after frequent references. At first the Board offered £500 towards the Company's costs, and afterwards £800. The latter sum was accepted by the Company, and he protested against the Company repudiating the arrangement simply because their costs came to £200 or £300 more than they had expected.

Mr. MICHAEL said if the Board would make no fresh arrangement, his only course was to ask the Committee to help him to get the Bangor Water and Gas Bill re-committed.

The Committee-room was then cleared; and, on the parties being called in,

The CHAIRMAN said the Committee had decided they could not ask Parliament to re-commit the Bill.

Mr. MICHAEL said he would make a last appeal to the Local Board to enter into a new arrangement. If they declined, the Company would either have to oppose the new clauses or the whole Bill in the House of Lords. He appealed to the Board not to incur an expense four times as great as that required to settle the present dispute.

Mr. RICHARDS said he was not anxious unnecessarily to spend a single penny. The Board would go on with the new clauses, which would be found to carry out exactly the arrangements come to.

The Counsel for the Company then withdrew, reserving their opposition to a later stage of the Bill.

The new clauses were read and agreed to, and the Chairman was ordered to report the Bill, as amended, to the House.

HULL GAS SUPPLY.—Mr. James Baynes reports that the gas sent into the district of Sculcoates and Myton during February, by the British Gas Company, gave the following results, free ammonia and sulphuretted hydrogen being at no time present to the ordinary tests:—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16.40	15.01	15.81
Grains of sulphur per 100 cubic feet	31.00	27.00	29.30
Grains of ammonia per 100 cubic feet	—	—	0.50

Mean barometer, 30.20; Temp., 54°.

SALES OF PROVINCIAL GAS SHARES.—At Richmond (Surrey), on the 6th inst., there were sold by public auction 100 new £10 shares in the Richmond Gas Company. The shares were put up in ten lots, and realized the following prices:—Lot 1, £130; lot 2, £120; lot 3, £125; lot 4, £125; lot 5, £115; lot 6, £122 10s.; lot 7, £120; lot 8, £122 10s.; lot 9, £120; and lot 10, £122 10s. On the 14th inst., £525 Margate Consolidated Stock—Isle of Thanet Gas Company—on which a dividend of 7½ per cent. is paid, was offered for sale by auction in nine lots, and realized £1200. On the 15th inst., £70 of preference stock in the Lincoln Gas Company was sold by auction for £87.



# Legal Intelligence.

## HIGH COURT OF JUSTICE—CHANCERY DIVISION.

FRIDAY, MARCH 22.  
(Before the MASTER of the ROLLS.)  
ROSE V. WOODFORD LOCAL BOARD.

Mr. MARTEN, Q.C., in moving, on behalf of the plaintiff, to restrain the defendants from discharging, or permitting the discharge of, foul matters from any of the sewers under their control into the River Ching, so as to pollute the water of the river, or render the same offensive or unfit for use where it passes the plaintiff's property, said: The plaintiff is the owner and occupier of a house called "The Laurels," which contains, besides the dwelling-house or mansion, about 25 acres of land, adjoining the River Ching, within the district of the Woodford Local Board.

Mr. CHITTY, Q.C. (who appeared for the defendants): The discharge of sewage has been going on a great many years, and an application has been made by the plaintiff to the Local Government Board.

Mr. MARTEN: They have made a suggestion. The Local Government Board, in a letter of the 11th of March, have pointed out that you may obtain land by which you may purify the sewage before it comes into the river.

Mr. CHITTY: It is hardly a subject to be discussed upon interlocutory motion.

Mr. MARTEN: I am quite willing that the defendants should have time; but this has been slowly accumulating by the laying down of pipes which have sent sewage into the river.

Mr. CHITTY: The pipes have not been laid down by the Local Board, but by somebody against whom the Local Board proceeded.

Mr. MARTEN: The sewers are vested in the Local Board, and they are bound by Act of Parliament to purify the water.

Mr. CHITTY: I do not think we can dispose of this for any useful purpose on motion for injunction. Let the motion stand over.

Mr. MARTEN: If you will undertake not to do anything in the way of causing further pollution. Will you proceed at once to carry out the suggestions of the Local Government Board?

Mr. CHITTY: We have not arranged our plans, and there is a serious question with regard to your right to the water, and so on. It is within the Epping Forest district, and the Local Board desire to wait until the Act of Parliament is passed.

Mr. MARTEN: If you will put in your statement of defence in a day or two, we can file in our reply, and the matter can be tried these sittings. Our house has nothing at all to do with Epping Forest. The defendants say they are not quite certain what the area ultimately will be within their district for the purpose of draining; but our land is within their district, and has nothing to do with Epping Forest.

The MASTER of the ROLLS: They cannot have a right to pollute a river.

Mr. MARTEN: They must undertake not to cause any further pollution. For five years they have done nothing but correspond. We have had an inquiry by the Local Government Board, and the defendants have made all sorts of excuses.

Mr. CHITTY: As far as we know, nothing is likely to occur to increase the nuisance.

Mr. MARTEN: I have an affidavit from an analytical chemist, a local physician, a gardener made very ill last year, and a cowman whose cows have been poisoned. There is also an affidavit of that great authority, Mr. Bailey Denton.

Mr. CHITTY: The Local Board do not intend to increase the discharge. If any new houses are built, and they drain in the river, the Local Board may not be able to prevent it.

Mr. MARTEN: The Local Board are bound by Act of Parliament to make proper sewers.

The MASTER of the ROLLS: They will undertake that they will neither make themselves, nor permit any new connection with any sewer or drain, or any other connection whereby any foul water or sewage can be poured into the river.

Mr. MARTEN: Very well.

The MASTER of the ROLLS: The costs will be costs in the action.

## ESSEX LENT ASSIZES.—WEDNESDAY, MARCH 20.

(Before Justice MANISTY and a Special Jury.)  
WALKER V. THE GASLIGHT AND COKE COMPANY.

Mr. WILLOUGHBY and Mr. CRISPE were counsel for the plaintiff; Mr. WILLIS, Q.C., and Mr. PAINE for the defendants.

This was an action to recover damages for personal injuries alleged to have been sustained through the negligence of the defendants servants. The defendants pleaded that at the time of the accident the plaintiff was in their service, and attributed the accident to his own negligence.

The evidence for the plaintiff was that before the accident he was a stevedore, earning about 30s. a week, in the service of Messrs. Westwood and Bailey, engineers. He was 30 years of age, married, and had two children. In the summer of last year he was engaged, with others of Messrs. Westwood and Bailey's workmen, in erecting a steam lift at the works of the defendant Company at Bromley-by-Bow. For this purpose they put up a derrick, or upright mast, kept in equilibrium by four ropes and a quantity of staging. On the 16th of July some workmen in the employ of the Gas Company also put up a derrick, which, it was alleged on the part of the plaintiff, was erected by incompetent men, who performed their work so unskilfully that first of all it toppled over into the adjoining canal, and was subsequently being adjusted in such a clumsy manner that it fell against the guy rope of Messrs. Westwood's derrick, causing it to fall against the staging, and displacing certain planks, 14 feet long and 4 inches wide, which fell from a height of 22 feet upon the plaintiff, who was working below. They struck him upon the neck and shoulder, and he was picked up in a sad condition. He was for a considerable time under treatment in the London Hospital. It was found that he was suffering from wry neck, the left side of the body was paralyzed, there was partial paralysis of the spinal cord, the left arm was wasting, and there were other serious injuries. His weight had fallen from 13 st. 3 lbs. to 9 st. 6 lbs., and it was believed that he would be permanently incapable of any physical labour.

Mr. Reeves and Mr. Harold Palmer, two gentlemen connected with the medical staff of the London Hospital; Dr. Abbott, Consulting Surgeon to the East London Dispensary; and Mr. Clarke, a surgeon attending that dispensary, were called on behalf of the plaintiff. They all described the injuries as being of a most serious character, and as being in all likelihood permanent. In reply to Mr. WILLIS they said they did not think the plaintiff had shammed, or exaggerated his injuries, although the case presented some unusual features.

Mr. WILLIS, in addressing the Jury for the defence, intimated that he should call evidence to show that there was no want of due and proper care on the part of the defendants servants, that the accident was not of the serious character that it had been represented to be, that the plaintiff had shammed, and that, in point of fact, he would probably soon be able to undertake some light employment.

Mr. Rivington, Consulting Surgeon to the London Hospital; Dr. Jackson,

Physician to the London Hospital and to the National Hospital for Paralysis and Epilepsy; and Mr. Hutchinson, Senior Surgeon of the London Hospital, were then called. They all stated, from careful observation, and examination of the patient, that they were fully of opinion he was malingering or shamming. It appeared also that when the plaintiff first presented himself at the hospital the case was regarded as an unimportant one. It was not until a few days later that he became an in-patient.

Several workmen were also called, who stated that all reasonable precaution was taken with the derrick, the rope of which slipped through being wet with rain, and that the derrick of Messrs. Westwood and Bailey was not so secure as it ought to have been.

Mr. WILLIS contended that the plaintiff's case had been fully answered.

Mr. WILLOUGHBY said the defence set up was one which invited criticism. It meant, not only that the plaintiff was shamming, and conspiring to get money out of the Company by a verdict, but, *a fortiori*, that the medical gentlemen who had given evidence on his side were co-conspirators with him, and were trying to palm off on the Jury a grossly fraudulent and dishonest claim. These charges were not justified, and the common sense of the Jury would prevent them from believing that the alleged shamming had been going on, and been propped up, since the 16th of July last. He confidently anticipated that the Jury would find this was a genuine case, and give the plaintiff substantial damages.

His LORDSHIP summed up with great care. In reference to the medical evidence, he said it was often asked, When doctors disagree, who shall decide? Well, he knew of no tribunal which could decide except a Jury, and he had no doubt the Jury before him would decide the difference in this case satisfactorily. When they found able medical men of high reputation differing as they had differed in this case, they must summon common sense to their aid, for common sense was not to be put aside in a case of this kind. They had seen the plaintiff in the box, they had seen all the other witnesses, and they would be able, to some extent, to form a conclusion, from their own observations, on the question of malingering or otherwise.

The Jury, after a short absence to consult, found a verdict for the plaintiff—damages, £1050.

## PORTSMOUTH BOROUGH COURT.—WEDNESDAY, MARCH 13.

(Before Mr. W. H. GARRINGTON, Mr. W. PINK, and Captain HODGKINSON.)  
PROSECUTION OF A GAS COMPANY FOR SUPPLYING GAS OF DEFICIENT ILLUMINATING POWER.

The Portsea Island Gas Company were summoned by the Corporation for having, on the 15th of November last, supplied gas of a less illuminating power than it should have been according to their Act.

Mr. WARNER SLEIGH (instructed by the Town Clerk) appeared for the prosecution; and Mr. HENRY FORD (instructed by Mr. J. Douglas, the Secretary of the Company) was for the defence.

Mr. WARNER SLEIGH, in opening the case, said the information was laid at the instance of the Corporation, for a breach by the Company of the Act of Parliament under which they exercised certain privileges and certain rights in the carrying out of their business as manufacturers of gas. He thought it would be unnecessary for him to allude *in extenso* to the several Acts bearing upon the matter, and that it would be sufficient for him to refer to the Gas-Works Clauses Act of 1871, and the Company's Provisional Order of 1872. As to the authority under which the summons had been taken out, it was provided that the testing of the gas should be made by an Examiner appointed under the statute, he being allowed to test between five and ten in the evening during the summer months, and between eight and ten in the winter months. That testing had to be performed according to certain rules which were very clearly set forth in the schedule of the Act of 1871; and Mr. Moncreaff, the Examiner, would tell them that he had acted in strict accordance with those rules in order to come to a proper result. The Examiner having effected his tests, was directed to furnish a copy of his report to the Company upon the day immediately following; but he frankly admitted that, in the present case, he did nothing of the kind, although it would be shown that the Company's agent had a report of the examination at the time. He (Mr. Sleigh) made this explanation because he did not wish it to be said that he was keeping anything back, or that he was hiding any of the circumstances. On the 15th of November, Mr. Moncreaff tested the gas at the Company's testing-house in West Street, Southsea, so as to arrive at a result in accordance with the Company's Provisional Order, which bound them to supply gas of 14 sperm candles illuminating power. At half-past eight on that evening, however, the quality of the gas was found to be only equal to 13.59 candles, and at a quarter after nine o'clock it had fallen to 12.16 candles. Those were the simple facts up to the evening of the 15th of November, with regard to Mr. Moncreaff's actions; but it was necessary that he should point out that Mr. Ballard, an agent of the Company, was present at the testing, and took down upon a piece of paper the result at which Mr. Moncreaff had arrived while his eye was at the photometer. Mr. Ballard reckoned up with Mr. Moncreaff the numbers, and carried the result away with him, and thus the Company had a report of the testing which had taken place, and a report which could not be more satisfactory, it having been made by their own Inspector with respect to operations carried on in his very presence. The two Examiners perfectly agreed, and the matter was over for that day. He (Mr. Sleigh) took it that probably some point would be made, owing to the report not having been served on the Company on the day following the testing. But he urged that the defendants had a report; and, more than that, he said that even not having a report had nothing to do with the jurisdiction of the Court, and that it had nothing whatever to do with the section which gave the Magistrates power to impose a fine. Supposing it were a civil action, he said that, under the 33rd section, the report would be receivable either for or against the Company. But that section did not assist the Magistrates in any way. The Act of Parliament was divided into two separate portions. Beginning at the 28th section, there were provisions for the testing of the gas, and what the Gas Examiner should do for the Company, so that they might know that they had a proper report of the proceedings of testing, and after that there was a section which recited other stipulations. Then came sections referring to the jurisdiction of the Magistrates in the matters of penalty, and the 36th section said that, "if it should be proved to the satisfaction of two Justices, not being Shareholders in the undertaking, that the gas was of less illuminating power or of less purity than the undertakers had agreed upon, they (the undertakers) should pay to the Local Authority, or any other person so suing, any sum not exceeding £20, as such Justices should determine." That was the section which gave the Court jurisdiction. It did not say that the Justices should be satisfied that the Examiner had given a report on the following day, but that, if the gas were proved impure or deficient in illuminating power, the Company should be bound to pay the penalty to the Local Authority. There was proof that Mr. Moncreaff had found the illuminating power of the gas to be 13.59 candles at half-past eight, and 12.16 candles at a quarter after nine on the same evening, instead of 14 candles; and if the Magistrates were satisfied, and were clear upon that point, then the offence was made out and the penalty was compulsory. It was a matter of great importance that the question should be once and for all decided, and if he had not felt it was so, he should not have been justified in taking up their



time, believing that it might have a very beneficial effect upon the Company in the future, and might make them more careful in the performance of their duties. When they recollected that the Corporation had to pay a fixed sum per annum for the supply of gas to their street lights, amounting to many thousands of pounds, it was material to them and to the public that they should have value for their money, and that the proper quality of gas should be continued throughout the night. What was felt on the part of the Corporation was that the gas was under the 14 sperm candles standard, and that it varied in quality even during the hours at which the Examiner had liberty to test, those hours being limited, as he had already pointed out. It was, however, very important that the gas supplied after the stipulated hours, both in summer and winter, should be kept up to its proper standard, as then the streets were more deserted than earlier, the lamps being intended for the convenience and for the protection of the public peace and comfort. The Corporation also felt that, whether or not the illuminating power were kept up during the night, it was very unsatisfactory to find such vast differences as he had alluded to within an hour or two. They had been urged to take up the matter because they had noticed the varying lights in the streets, and from the fact that, both in the public lamps, and in the houses of private consumers, the gas went down in an unaccountable manner during those hours in which the Gas Inspector was not entitled to test.

Mr. GARRINGTON: Is it the case that notice is to be given on all occasions of testing?

Mr. SLEIGH: Yes, sir.

The CLERK: It means that notice is to be given in writing.

Mr. SLEIGH said what he urged was that the report, which was receivable in evidence, did not affect the jurisdiction of the Magistrates. He might say at once that, if the Magistrates had any doubt upon that point, he should ask for a case to be granted for a Superior Court. The 33rd section said that the Company should have a report on the day following the testing, in order that there might be no delay; and he contended that the Company did have a written report, which was made between the Examiner and their own Inspector, the two reducing the results of the testing into figures. He thought it would be making the Act of Parliament an absurdity to say that the Company had not had any report. They had received all the information they required, for the report was simply the figures showing the quality of the gas; and this the Company had, the experiments being made in the presence of their own official, reduced into figures, and given to him.

The CLERK: But it says the day after the testing a report shall be given.

Mr. SLEIGH thought that if the Company had received their report one day before they were entitled to it, they had nothing of which to complain. Acts of Parliament, even when relating to penal offences, were to be construed with their context and according to the English language, and they were not to be distorted for the purpose of supporting any quibble to relieve an offender from penalty. Therefore, as the context provided that the Company should have knowledge immediately after the results of the Examiner had been arrived at, was it not going beyond the Act to say that it was not sufficient, when a report of what had been done in the presence of the Company's own Inspector was delivered to him? If this particular point was to settle the case, he thought it would be better to determine at once, before going into facts, whether the Magistrates were of opinion that they had jurisdiction.

The CLERK said it was clear that the 33rd section was as to facts.

Mr. FORD said he probably should have a great deal to say about the matter.

Mr. SLEIGH: It is a very inconvenient mode of suggestion; but I think I will wait until Mr. Ford raises technical points.

Mr. Henry Moncreaff, the Gas Examiner, was then called, and gave formal evidence of the deficiency in illuminating power, as mentioned in counsel's opening speech. He said that he and Mr. Ballard reckoned up the result of their testing, and as he gave it Mr. Ballard wrote the result down. He was fully aware of the mode of testing as laid down by the Act of Parliament, and the testing was taken strictly according to the rules, and no objection was made by Mr. Ballard as to the mode of testing, or as to the result arrived at. He could scarcely remember what Mr. Ballard said on the occasion, but he acknowledged that the illuminating power was down.

In cross-examination, witness said he had for the last seven years tested about four times every week, and had never received the slightest interruption from any of the Company's servants; but, on the contrary, he had been afforded every facility for the discharge of his duties. He had not laid any information against the Company before, never having received any instructions to do so. The gas had been under the standard about three or four times a quarter, and he had reported it on each following day to the Town Clerk. Since the 29th of November he had furnished a report to the Company, and he had done so in consequence of something which had passed between himself and the Company's Examiner, Mr. Ballard. He had been asked to allow his observations to be tested and had refused. Observations had been taken by the Company's agent on the 15th of November, after he had made his, and the figures differed. Mr. Ballard had told him that he had taken observations, and that the results were above his. He had taken a second observation on the 15th of November, because he saw the photometer was gradually going down. In his opinion, the difference between his and Mr. Ballard's observations was because the gas was coming from a separate holder at Rudmore, and that the gas was of two qualities. It took ten distinct observations of one minute each to get at a test. The photometer was a very nicely constructed instrument, and he did not know that two careful manipulators might come to different results.

In re-examination, witness said he had been acquainted with gas and meters ever since 1863.

Mr. FORD then addressed the Magistrate on behalf of the Company, who, he said, had been in existence ever since 1821, and had done a good deal to advance the interests of the inhabitants; but they now, for the first time in their extensive experience, appeared before the Justices for having committed an alleged breach of the law. He did not, however, consider that the Company had done anything very serious. They had gained a reputation for having attended to the wants of the inhabitants in an exceptional way, and, although he was not a Shareholder, he could say that the Company were prosperous, and had administered their affairs with prudence and caution. He was there to say that it had been the constant and unremitting study of his clients to meet the wants and necessary supplies of the public, while benefiting those who were Shareholders; but for what were they in Court that day? It had been said that after a career of many years, and being subject to the operation of very stringent Acts of Parliament, they in November last so offended the authorities of the borough that they were dragged into Court to answer all that was alleged against them. First of all he denied the accuracy of the evidence on the other side, and said that Mr. Moncreaff's figures were controverted by a man who was equally to be depended upon; and, beyond that, there had been kept back from the Magistrates facts which ought to have been given. Not only did he deny that the illuminating power of the gas was less than it ought to have been, but he also asserted that, under the Acts which governed matters of this kind,

the Company had a right to say that, even if the gas was of less illuminating power than stated in the section, it was unavoidable. The first thing he inquired about was if there was any excuse for his clients, and he discovered that by the Act of 1861 there were privileges conferred upon the Company, and those privileges still existed. The 20th section of the Portsea Gas Act provided that, "unless by reason of frost, accident, unavoidable casualty, or deficiency of coals," the standard of the gas should be equal to twelve sperm candles." During the year 1872 it became necessary, for the internal interests of the Company, that a Provisional Order should be obtained, and in the month of June of that year an Order was passed which said that "it did not affect any previous Act," the only alteration being in the 15th section, which raised the standard of illuminating power from 12 to 14 candles. And it was expressly stated in the Confirmation Act that "no Company shall incur any penalty for non-illuminating power or for excessive impurity of gas where such shall be caused by unavoidable accident." He was not representing gentlemen who wished to get out of their obligations by any technical objections, but they were anxious to do their duty to the public and to their shareholders; and when they found Acts were passed for their protection, he asked the Magistrates to pay attention to those Acts. If he showed that the depreciation in illuminating power, granting for the moment that this was the case, was caused by accident, then he held that the Magistrates had nothing whatever to determine. In section 12 of the Act of 1872 it was laid down that "nothing in this Order shall in any way prejudice the powers or privileges of the original Act." The Company were bound, therefore, to supply 14-candle gas, and with this obligation they had almost invariably complied. It was plain to any man reading the Act that they were entitled to say their deficiency of illuminating power had been caused by accident. Then he came to another important part of the case. He should be sorry to think that Mr. Moncreaff would not receive his due meed of justice at his hands, for he admitted that he had good recommendations about him; but was he to come there and proclaim himself the infallible Examiner of Gas? It was very right that he should not be interrupted in his duties, but it was not provided that he was to go into the matter of examination solely and alone, the Act itself providing that another person might be present. Mr. Moncreaff, however, it was evident, presented himself there that day with a certain amount of bias. Numerous appliances had been brought to bear upon the question of gas, and, without going into details, they knew it was altogether differently manufactured now to what it was 20 years ago, and that they had scientific appliances and products from it now which were never thought of in the times of their forefathers; but, notwithstanding all that science had provided, the Examiner, in his experiments, had wholly to rely upon that sight with which Providence had blessed him for his results. It was well known what popular assemblies like the Town Council would have done had the Company compromised themselves by constantly providing a supply of gas deficient in illuminating power. They would doubtless have given instructions to prosecute to the full extent; but had he asked Mr. Moncreaff how many times the gas had been above the standard, they would probably not have got a correct reply. He ventured, however, to say that in 99 out of every 100 observations the standard of 14 candles had been exceeded. Human nature was always imperfect, and hardly to be relied upon; and, although the photometer was a very finely manufactured instrument, it was liable to mislead, requiring the nicest possible manipulation, any neglect of which necessarily led to mistakes. On the part of the Company, he utterly and distinctly denied Mr. Moncreaff's theory as to the two qualities of the gas; it being simply absurd, from the fact that there was but one source of supply from the holders and reservoirs to the town. He proposed, too, to show the Magistrates that on the day in question a test was made by the Company's own officer at 7.30, and at that time the illuminating power of the gas was 14.62 candles; and all this would be to some extent an answer, because it would show that the standard was above rather than below the figure imposed. His account of the gas being of less quality, supposing it to have been so after their own test was taken, was that it was wholly unavoidable. There were certain enemies with which gas makers had to contend, and which were ammonia, sulphuretted hydrogen, and carbonic acid; and what he was going to prove was that on each of the occasions to which the informations referred there was present a quantity of carbonic acid, reducing the illuminating power by one candle. The Company were under the impression, at that particular time, that they had provided sufficient plant for the expected demand upon them; but, in November, they were overtaken with a demand greater than they could meet, and had to resort to every possible means of manufacture. The increased demand which they had to meet was  $4\frac{1}{2}$  or 5 million feet of gas, and it put the Company to their wits ends. They sent to London for appliances to remove the cause of the deficient illuminating power, and they overcame the difficulty; but that there was a deficient supply they did not admit, although there might have been an excess of carbonic acid. The Company were now expending £10,000 to properly meet the wants of the public during the next winter. With regard to the serving of the written notice, he contended that it ought to have been done on the day succeeding the testing, and he also expressed his opinion that Mr. Moncreaff was liable to an indictment for having failed to do so. In conclusion, he said that this was a case which had given rise to a great deal of discussion in the town, but when the Town Council found that deficiencies were so few, he should have thought that the Committee would have been glad to have listened to any explanation which the Company had to offer. One-fourth of the members of the Town Council being Shareholders in the Gas Company, their lips were, of course, sealed; but he hoped, even then, at the last moment, his learned friend on the other side would see his way clear to withdraw, and thus say that the Company had done all they could, that they were willing to take a conscientious view of their duties, and that the deficiency must never happen again.

Mr. SLEIGH said that, after consulting with the Town Clerk, they were anxious to do what was right in this matter. If he might take it from Mr. Ford that the deficiency was due to some unaccountable accident, and that in future more care would be taken to supply the public wants, then he believed it would be satisfactory, and he would be prepared to take the course suggested.

Mr. FORD: We admit that there was a deficiency in the quality, and we promise that for the future more care will be taken in regard to the supply.

Mr. SLEIGH said, that being so, he would withdraw the whole of the informations. The Company would probably feel that they had a duty to perform to the public, and that they, as far as possible, would take care that no accident should prevent the town being properly supplied with gas in return for the great privileges which they enjoyed.

The summons for the date in question, and three others, were then withdrawn.

#### LAMBETH POLICE COURT.—MONDAY, MARCH 11.

(Before Mr. ELLISON.)

#### ILLEGAL CONSUMPTION OF GAS.

Ernest Therry, 2, Union Road, Clapham Road, appeared to an adjourned summons, taken out by the Phoenix Gas Company, for having, on or about the 5th ult., unlawfully and improperly used and burned gas belonging to the Company, without giving notice.



The summons was originally against a Mrs. Pouboif, for illegally connecting the gas after it had been cut off. This summons was adjourned, as Marie Pouboif did not appear; and it being stated that the present defendant was the occupier, proceedings were taken against him. Evidence was now given showing that, after the gas had been cut off, it was found to be burning at the house from the 6th to the 8th of February. On the 9th of February the defendant came to the office of the Company, and admitted that he was the occupier, and asked to be supplied with gas.

The defendant, through an interpreter, contended that he was not the party who really burned the gas, and called a witness, who stated that a meeting of a "French Company" was held at the house on the days mentioned in the summons, and the gas burned on account of such meeting. The witness, however, in cross-examination, admitted that the defendant was a member of the French Company, and must have known the gas was being consumed.

Mr. ALLEN, who appeared for the Gas Company, said, in answer to the Magistrate, there was no desire to press for the heavy penalties defendant had rendered himself liable to under the Act.

Mr. ELLISON said it was, no doubt, a most important matter for the Gas Company. The defendant had said he was not the occupier; but it had been shown that he had gone to the Company's office, and declared he was the occupier, and had even paid the amount due. It was quite clear he was the occupier, and a member of the French Company, whose meetings were held at the house at the time the gas was consumed. It might have been a matter of neglect; and as the Gas Company did not wish to press the case, he should only order the defendant to pay a penalty of 20s., together with full costs.

#### WANDSWORTH POLICE COURT.—WEDNESDAY, MARCH 13. (Before Mr. PAGET.)

##### THE INCONVENIENCE OF PARTNERSHIP ARRANGEMENTS IN WATER SUPPLY.

The occupier of a house at Wimbledon attended to complain of the Southwark and Vauxhall Water-Works Company cutting off his supply. He said he had made three applications to the Company, but he could not obtain any reply. He did not owe the Company any money, but his next-door neighbour had refused to pay an alleged overcharge. There was one supply for the two houses into a tank which stood on his (the applicant's) premises.

Mr. PAGET inquired whether the applicant had tendered the whole amount for the two houses.

The applicant said he had not.

Mr. PAGET told him he must do so before he would be entitled to a supply of water.

Another man living in Battersea also attended to complain of the Company cutting off his supply under similar circumstances.

Mr. PAGET said the applicant must tender the money for the present quarter, as the Company were not bound to trust him. If the Company refused to supply the applicant after he had tendered the money, he could apply to him again.

**MOLD GAS AND WATER COMPANY.**—At the half-yearly meeting of the above Company, held recently, the report of the Directors to the Shareholders was adopted. The balance-sheet showed a net profit available for dividend for the year of £931. A dividend of 7 per cent. was declared on the year, the remainder going to the contingent-fund for renewal of mains, &c. The two Directors whose term of office expired were re-elected, and it was determined to lay larger mains through the town, those now in the ground having been in for many years, and being too small. The usual votes of thanks closed the meeting.

**GAS EXPLOSION AT RICHMOND (YORKS).**—The inhabitants of the west end of Richmond were much alarmed, on the morning of the 19th inst., by a couple of loud reports, resembling the sound of a cannon. The inmates of the workhouse were almost suffocated with a strong smell of gas, and for some considerable time they were unable to discover the place of escape. Eventually one of the male inmates happened to try, with some lighted paper, a large sanitary pipe, a portion of which is open in the yard adjoining the vagrants ward, when there were two loud explosions. The workhouse was shaken from its foundation, and several of the walls were cracked and thrown out of order. Outside the workhouse the terrace was blown up for a distance of 30 yards, and there were eruptions of earth at different places along the sewer—into which there had undoubtedly been an escape from the gas-main—for perhaps 60 or 70 yards. Fortunately no person was injured, though the man who caused the explosion had a narrow escape.—*Northern Echo.*

**ASHTON-IN-MAKERFIELD GAS-WORKS.**—Mr. J. E. Fairless, the Clerk and Gas-Works Manager to the Local Board of Ashton, in his report for the quarter ending Dec. 31 last, says: "The manufacture of gas at your works during this and the corresponding quarter of last year was as follows:—

Quarter ending	Total Quantity of Gas manufactured in Feet.	Weight of Coals used in Tons.	Average No. of Feet per Ton.
Dec. 31, 1876 . . .	1,346,000	164	8,200
Dec. 31, 1877 . . .	1,407,000	150	9,400
Increase in 1877 . .	61,000	—	1,200
Decrease in 1877 . .	—	14	—

Taking the 150 tons of coal used, these figures show a total gain of 180,000 feet from the same quantity of coal as compared with last year. I may also remark here, that the above statement shows a gain of 2000 feet per ton as compared with 1875, when there were nothing but iron retorts in use. I believe that these very satisfactory results are principally to be attributed to the entire renewal of the retorts during the summer, the whole of which work was very carefully done by your own workmen during the intervals when they were not employed in charging or otherwise in the making of gas. The following figures will show how the above has been distributed, and also the quantity of gas unaccounted for in leakages, &c., as compared with the same quarter of last year:—

How Distributed.	1876.	1877.
Sold to private consumers . . .	1,022,600	1,149,800
Supplied to public lamps . . .	194,500	182,300
Consumed on works . . .	15,000	15,000
	1,232,100	1,347,100
Unaccounted for . . .	113,900	159,000
	1,346,000	1,407,000

The per centage of leakage in 1876 was 9, and in 1877, 11½. The slight increase, I think, may be fully accounted for by the subsidence near Pewfall Colliery. Considering that you have a great length of mains, nearly five miles, and a very small proportionate consumption, I think these figures speak well for the soundness of your mains, as the per centage is considerably under the average."

## Miscellaneous News.

### METROPOLIS GAS SUPPLY.

**METROPOLITAN BOARD OF WORKS.**—At the meeting of the Board on Friday last a letter was read from the Board of Trade, stating, in reply to the Board's letter, that they are not prepared to deal with the subject of the proposed amendment of the penalty clauses in the Acts of The Gaslight and Coke Company and the Commercial and South Metropolitan Gas Companies during the present session.

Dr. Whitmore's report on the illuminating power, pressure, and quality of the coal gas consumed in the parish of Marylebone, and supplied by The Gaslight and Coke Company, during February:—

	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quantity of Sulphur in 100 Cu. Ft.		Mean Quantity of Ammonia in 100 Cu. Ft.		Sulphuretted Hydrogen
	*Mean of 23 Obser.	High-est.	Low-est.	High-est.	Low-est.	Grains.	Grains.	Grains.	Grains.	
Gas supplied from the Fulham works	16.61	17.60	15.94	20.45	9.61	20.75	0.55			No trace
Gas supplied from the Beckton and Bow works	16.54	17.31	16.11	35.10	18.72	12.75	0.45			No trace
Cannel gas supplied from the Pimlico works	20.82	22.10	19.56	21.02	12.19	16.85	0.50			No trace

Mean of daily readings of barometer . . . 30.02  
" " " thermometer . . . 57.53

\* Each observation consists of ten readings of the photometer, at intervals of one minute.

The mean illuminating power of the gas supplied from the Fulham works was equal to rather more than 16½ candles; it ranged between 15.94 and 17.60 candles. Twice it exceeded 17 candles. The mean amount of sulphur in 100 cubic feet of this gas was rather over 20 grains, and of ammonia half a grain. The mean light from the Beckton and Bow gas was equal to 16½ candles; on no occasion was it below the standard, and twice it exceeded 17 candles. The mean amount of sulphur found was less than 13 grains, and of ammonia rather less than half a grain. The mean light from the cannel gas was equal to nearly 21 candles; it ranged between 19.56 and 22.1 candles; three times it exceeded 22 candles, and five times 21 candles. The mean amount of sulphur was under 17 grains, and of ammonia half a grain. The pressure of all the gases was satisfactory, and on no occasion was sulphuretted hydrogen detected by the ordinary tests.

### METROPOLIS WATER SUPPLY.

**WHITECHAPEL DISTRICT BOARD.**—At their meeting, on the 18th inst., it was resolved, on consideration of a report from their Works Committee—"That, in the opinion of this Board, the cost of the supply of water in the Metropolis, under the existing arrangements of the Water Companies, has become oppressive to the ratepayers, and threatens to become still more so, and that it is both important and desirable that the business of the water supply of the Metropolis should be exercised by a representative body, with power to acquire the interests of the existing Water Companies at the expense of the ratepayers. That the Metropolitan Board is, in the opinion of this Board, a body so constituted, and, if sufficiently increased in number before being invested with powers to undertake so large an accession of responsibility and duty, would be the proper body to undertake such duties, but, with the present limited number of that Board, such duties cannot, in the opinion of this Board, be effectually performed."

Major Bolton reports that the state of the water in the Thames and Lea was generally turbid and discoloured during the month of February. In the Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated), the water was turbid from the 1st to the 7th of February, it improved in clearness on the 8th, and from that date it remained fairly good up to the 15th, after which it again became discoloured, and remained in a turbid condition until the 19th, when it fined down and remained good for the rest of the month. The highest flood state of the river at Hampton during the month was 2 feet 5 inches above summer level, and the lowest reached the summer level. At Molesey the highest temperature of the water was 47°, and the lowest 37°, and the highest temperature of the air was 60°, and the lowest 30°; these observations were taken daily at 9 a.m. The rainfall at Molesey was 0.99 inches.

Dr. Whitmore's report on the composition of Thames Companies and other waters supplied to Marylebone during February:—

	In Grains, per Gallon.			In Parts, per Million.		In Degrees.	
	Total Solid Matter.	Loss by Incineration.*	Chlorine.	Free Ammonia.	Albumenoid Ammonia.	Hardness.	Hardness after boiling Fifteen Minutes.
West Middlesex . . .	21.60	0.90	1.16	0.01	0.07	14.8	3.4
Grand Junction . . .	21.64	0.95	1.18	0.01	0.08	14.9	3.4

\* The loss by incineration represents the amount of organic and other volatile matters contained in the Imperial gallon (70,000 grains) of water. The total solid matter, minus such loss, consisted chiefly of carbonate of lime, with small quantities of other equally harmless salts.

The water of both Companies, when drawn from the mains, as seen through a stratum of two feet in depth, was perfectly clear and colourless. The water taken from the Thames at Hampton was somewhat turbid.

**PROPOSED TRANSFER OF THE LOWER GORNAL GAS-WORKS.**—A meeting of the Upper Sedgley Local Board was held on the 12th inst., when the Gas Committee, appointed to advise the Board as to the expediency of purchasing the gas-works at Lower Gornal, for the purpose of supplying the district with gas, reported, as the result of their inquiries and conferences, that the Company had signified their willingness to sell the works for £3250, and that the present lessee would give up the lease on compensation being made to him for the unexpired term of five years. The Committee, after explaining the position of the matter, recommended the purchase, provided the works could be secured for £3000. Upon a motion to accept the recommendation and make the purchase, a discussion ensued, terminating in the matter being postponed until after the election of the new members of the Board.



CRYSTAL PALACE DISTRICT GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held on Thursday, the 21st inst., at the Albion Tavern, Aldersgate Street—ERASMUS WILSON, Esq., F.R.S., in the chair.

The following are the report and statement of accounts:—

The Directors report that the general working of the Company during the half year has been satisfactory.

Contracts have been made for coal at a lower rate.

The Directors consider that they are in a position to make a further reduction in the price of gas—viz., to 3s. 10d., per 1000 cubic feet to the general consumer; such reduction will take place from and after Lady-day quarter.

Considerable additions to, and improvements in, the works and plant have been made during the half year.

The Directors have purchased a large plot of freehold land adjoining the present works, available for future extensions.

The Directors going out of office by rotation are Mr. Frederick L. Linging and Mr. C. Lea Wilson, who, being eligible, offer themselves for re-election.

The Auditor going out of office by rotation is Mr. James Glaisher, who, being eligible, offers himself for re-election.

The reports, of the Gas Examiners of the parishes supplied by the Company, on the illuminating power of the gas, and its freedom from sulphuretted hydrogen and ammonia, continue to be satisfactory.

In accordance with the resolution of the extraordinary general meeting, held on the 20th of September last, the 25,000 new ordinary 7 per cent. shares of £6 each were allotted *pro rata* among the Stockholders. Of the total number so offered, 1031 were unclaimed or declined; these latter shares were again offered to the Stockholders in the proportion of one share for every £250 of stock held, and one share to all Stockholders holding less than £250 of stock; there now remain, however, 129 which have been a second time not accepted, and these are left for the Proprietors to deal with.

The accounts annexed show the financial position of the Company. The balance of profit and loss account amounts to £10,012 7s. Out of this sum the Directors recommend the declaration of a dividend for the year ending the 31st of December last as follows, viz.:—At the rate of 6 per cent. per annum on the ordinary stock, at the rate of 7 per cent. per annum on the ordinary 7 per cent. stock; at the rate of 10 per cent. per annum on the ordinary 10 per cent. stock; and at the rate of 7 per cent. per annum on the new ordinary 7 per cent. shares; all less income-tax. This will absorb £969 15s. 10d., and leave £342 11s. 2d. to be carried forward to the profit of the succeeding half year.

CR.

## REVENUE ACCOUNT, for the Half Year ended Dec. 31, 1877.

Dr.	REVENUE ACCOUNT, for 1880	
To Manufacture of gas—		
1. Coals, including all expenses . . . . .	£19,824	1 7
2. Purifying materials, wages, &c. . . . .	915	4 11
3. Salaries of Engineer and officers . . . . .	461	7 4
4. Wages and gratuities . . . . .	3,284	6 3
5. Works, machines, and retorts—		
Maintenance of, repairs, and labour. . . . .	4,871	13 11
		£29,356 14 0
Distribution of gas—		
6. Salaries of Chief Inspector, Inspectors, and Clerks in Light Office . . . . .	£725	17 0
7. Mains and service-pipes, repairs, maintenance, renewal, and labour . . . . .	719	9 1
8. Meters, gas-stoves, and regulators, repairing and renewing, &c. . . . .	1,150	18 11
		2,596 5 0
Public lamps—		
9. Lighting and repairing . . . . .		622 5 6
Rents, rates, and taxes—		
10. Rents . . . . .	£14	9 6
11. Rates and taxes . . . . .	1,638	7 11
		1,652 17 5
Management—		
12. Directors allowances . . . . .	£750	0 0
13. Salaries of Secretary, Accountant, Clerks, and Messenger . . . . .	555	18 2
14. Collectors commission . . . . .	413	9 0
15. Stationery and printing . . . . .	238	13 7
16. General establishment charges . . . . .	342	4 5
17. Auditors—		
June . . . . .	£15	0 0
December . . . . .	30	0 0
		45 0 6
Sundries—		
18. Law and parliamentary charges . . . . .		2,345 5 2
19. Bad debts . . . . .		969 11 11
20. Insurance-fund . . . . .		215 11 4
		198 10 6
Total expenditure . . . . .	£37,957	0 4
Balance carried to profit and loss account . . . . .		11,419 4 0
		£49,376 4 4

### PROFIT AND LOSS ACCOUNT (NET REVENUE).

1. To Reserved fund account, amount carried from the half year's profits	£1,800	0	0
2. Balance of net profit to be carried to next account, subject to half year's dividends to the 31st of December	10,012	7	0
	<u>£11,812</u>	<u>7</u>	<u>0</u>

The CHAIRMAN, in moving the first resolution, said the report was a contrivance which seemed intended, and very justly so, to relieve Shareholders from the inconvenience of a long speech from their Chairman, inasmuch as it stated briefly and succinctly, in a carefully arranged manner, the history of the Company during the past six months. It, however, was always pleasant to meet the Shareholders on an occasion like the present, because they met as friends, and also as having trust in one another. The working of the Company during the past half year had been satisfactory. The Directors had again to state that coal had remained at a lower rate than it was, during the coal famine at any rate, and that contracts had been made of a satisfactory character. The report also referred to the reduction in the price of gas. The Directors had always been accustomed to reduce the price of gas, but for a time were prevented doing so in consequence of a variety of circumstances, particularly the coal famine; but now they had returned to the old and very satisfactory action of reducing the charge for gas consumed, so that it was brought to the general consumers at 3s. 10d. per 1000 feet. The Shareholders were also informed that considerable improvements had been made in the works and plant, and that the Directors had taken steps to provide for the expectations which they entertained as to the progress of the Company, and also for those needs which were inevitable in consequence of the gradual and progressive increase of the Company's business. Finding that the land which they occupied was getting too small for the amount of expansion which they believed the Company would require, they had added a portion of freehold land immediately adjoining their own property, so as to enable them, and those who followed them, to carry on any increase of building and plant likely to be required for a considerable number of years to come. Not only were they doing their duty to their consumers, but they were also doing their duty to Parliament, and to the Government, by looking very sharply indeed after the chemical constitution and purity of the gas. This involved a matter of considerable difficulty, and considerable chemical delicacy, and they were bound to admit that it was one of the troubles against which they had to contend—viz., the necessity of reducing the sulphur constituents of gas to the minimum required by their Act of Parliament. As he had stated previously, that amount of reduction was not by any means necessary, either so far as the illuminating power of the gas was concerned, or the health of the population who consumed it; it was done to satisfy a scientific fancy on the part of their legislators, that a moderate, almost impossible, minimum should be required. At the last meeting he stated that this led to a good deal of inconvenience, especially to those who lived in the immediate neighbourhood of works, because the greater part of the disagreeable and annoying smells which might possibly proceed from gas manufacture were occasioned by the necessity which they were under of removing from it products which were not by any means objectionable, but really would be, and were, beneficial to the public health. However, for the present they must remain content with the state of legislation in this matter, trusting that good sense and time would relieve them from the difficulty. With regard to the distribution of the new ordinary 7 per cent. shares, the report stated that a small number still remained on hand; there were many who were eager to possess them, but the difficulty was to divide them equitably amongst the Shareholders. There were only 129 shares remaining. There were a good

By Sale of gas—

Michaelmas quarter—

1.	Private rental—								
	2,025,500 cubic feet, at 3s. 7d.	.	.	.	.	£362	18	0	
	1,390,100                 "	3s. 9d.	.	.	.	260	12	11	
	1,255,300                 "	3s. 10d.	.	.	.	240	12	0	
	50,767,900              "	3s. 11d.	.	.	.	9,942	1	0	
2.	Public rental and under contracts	.	.	.	.	1,779	7	11	
									£12,585 11 10
	Christmas quarter—								
3.	Private rental—								
	2,768,900 cubic feet, at 3s. 7d.	.	.	.	.	£496	2	0	
	2,266,200                 "	3s. 9d.	.	.	.	424	18	3	
	1,107,300                 "	3s. 10d.	.	.	.	212	4	9	
	113,119,700              "	3s. 11d.	.	.	.	22,152	12	0	
4.	Public rental and under contracts	.	.	.	.	1,760	17	9	
									25,066 14 9
	Gas-rental	.	.	.	.	.	.	.	
5.	Meter-rental—the half year	.	.	.	.	£37,652	6	7	
						630	6	2	
	Total rental	.	.	.	.	.	.	.	£38,282 12 9
	Residual products—								
6.	Coke, less labour and cartage	.	.	.	.	£7,867	0	10	
7.	Breeze                   "	"	.	.	.	187	15	0	
8.	Tar . . . . .	.	.	.	.	1,214	7	0	
9.	Sundries . . . . .	.	.	.	.	9	8	1	
									9,278 10 11
10.	Sulphate and ammoniacal liquor, less labour, &c.	.	.	.	.	1,815	0	11	

Total receipts . . . . .	£49,376 4 4
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1.	By Balance of net profit from last account . . . . .	£9,741 13 6		
	Less dividend paid for the half year ended the 30th of June . . . . .	9,504 13 9		
			£236 18 9	
2.	Balance from revenue account, being profit for the half year . . . . .		11,419 4 0	
3.	Interest on contingent-fund, &c. . . . .		156 4 3	
			<u>£11,812 7 0</u>	

number of Shareholders who might be entitled to one share each, and, therefore, a proposal would be made for the purpose of settling that matter in a mode more convenient than that of distributing so small a number amongst such a large constituency as they now possessed. The last sweet morsel of the report stated the financial condition of the Company, and the amount of dividend that fell to each of the Shareholders. Those were the general points, and, without further comment, he should move—"That the report of the Directors, and the balance-sheet confirmed by the Auditors, be received, adopted, and entered upon the minutes."

The DEPUTY-CHAIRMAN (Mr. H. P. Stephenson) seconded the resolution, which was unanimously agreed to.

Mr. BENGOUGH said in order to get rid of the difficulty mentioned by the Chairman, he would move that the 129 remaining shares be given to the Directors, to divide as they thought fit among themselves and the officers of the Company. The Shareholders thought a good deal of their officers, and were always in the habit of passing a vote of thanks to them. There was not much solid food in this, and he thought that if the Directors could see their way, in any manner, to reward their officers with a few shares, the Shareholders would be perfectly agreeable to have such a course adopted.

Mr. Pocock said he had much pleasure in seconding the resolution, and referred to the restrictions placed upon them by Act of Parliament with regard to the purity of the gas, and urged that, so far from improving, it was deteriorated. When Parliament opened their eyes to this fact, no doubt the Directors would be released from the trammels under which they were placed.

The resolution was unanimously agreed to.

The DEPUTY-CHAIRMAN moved—"That the dividend for the half year ending Dec. 31 last be now declared, and be made payable forthwith at the following rates per annum—viz., 6 per cent. on the preference stock; 7 per cent. on the ordinary 7 per cent. stock; 10 per cent. on the ordinary 10 per cent. stock; and 7 per cent. on the new ordinary 7 per cent. shares."

Mr. LING seconded the resolution, which was carried unanimously.

Mr. GEORGE LIVESY moved—"That Mr. F. L. Linging, an outgoing Director of this Company, be re-elected a Director of the Company." He said it would be very unbecoming to say anything in Mr. Linging's praise in his presence; however, the Shareholders knew they could not possibly have a better Director than Mr. Linging, and he therefore had great pleasure in proposing his re-election.

Mr. NEWTON proposed the re-election of Mr. C. Lea Wilson as a Director, and said he was sure that to mention his name was quite sufficient to secure a unanimous re-election.

Mr. CURTIS seconded the resolution, which was agreed to.  
On the motion of Mr. BENNETT, Mr. J. Glaisher was re-elected an Auditor of the Company.

Mr. R. H. JONES moved—"That the thanks of this meeting be given to the Directors of the Company for their able management of the affairs of the Company." Many of the Directors, he said, were personally known to him, and he felt satisfied that they could not possibly have a better set of men to sit round that board.

The resolution was seconded and agreed to.



The CHAIRMAN, in responding, said the Directors were very grateful for the kind manner in which the resolution had been received, and he might state, on their behalf, that what they had done hitherto was only a sample of that which it was their intention to do as long as they remained Directors of the Company. With regard to Mr. Pocock's observation, it was perfectly true that there was nothing in nature perfectly pure, and if it were so, it would be unfitted for the uses of life to man. As to the day coming when Parliament would open their eyes, he was sure it was a day they would not see. His experience of society amounted to this, that even Mr. Gladstone had a glimpse of the truth when he said—most uncomfortably and undesirably—that agitation was the only way in which it was possible to obtain anything in this favoured country; and it was only by pointing out, as they did from year to year, the unfairness of the proceedings forced upon them by Committees of the Houses of Parliament, that they could hope for their removal. They must do so. They must not call together their thousands under the tree of liberty in Hyde Park, but they might quietly, amongst themselves, say, "This is very wrong, and we shall do our best to remove it." That gentle kind of social agitation, without interfering with the happiness of society, would, no doubt, end in the attainment of that which they desired. He thanked them most heartily for their vote of thanks; and had now the pleasant duty to perform of moving a vote of thanks to the Auditors and officers of the Company. It was hardly necessary to repeat how essential these institutions were to the existence of the Company—their Auditors, who diligently and carefully examined their figures and accounts, and their officers, who equally diligently and carefully looked after the working interests of the Company. This was a resolution which would be accepted by all present. There was not even a spot upon that sun that enlightened their Company which could throw the slightest shadow upon their Auditors or officers.

Mr. LINGWICK seconded the resolution, which was unanimously adopted. Mr. LAYTON, one of the Auditors, responded, and in doing so assured the Shareholders that their thanks were eminently due to the officers of the Company for the admirable and straightforward manner in which the books were kept. It was difficult to conceive how a set of books could be kept in a better way. He hoped, in time to come, they would be equally transparent, and that the thanks of the Shareholders might be continually due, not only to the Auditors, but also to the officers who so richly deserved them on the present occasion.

A vote of thanks to the Chairman brought the proceedings to an end.

#### ROCKHAMPTON (QUEENSLAND) GAS COMPANY.

The Half-Yearly General Meeting of Shareholders was held in the Council Chambers, Rockhampton, on Thursday, Dec. 20, 1877—Mr. H. JONES, the Chairman of the Company, presiding.

The SECRETARY read the report of the Directors, which was as follows:—

Your Directors have the pleasure of presenting their tenth half-yearly report, and furnishing to the Shareholders a statement of the Company's affairs.

The business of the past six months will allow the usual dividend, which the Directors recommend to be declared at the rate of 10 per cent. per annum, leaving £162 19s. 9d. to be carried to the reserve-fund.

It is often said that the success and progress of a Gas Company is a fair index of the state of trade and prosperity in a town, and here in Rockhampton, where the dulness is severely felt, owing to the long continued drought, the Directors congratulate you that the Company have maintained their ground in the face of difficulties and drawbacks, and that for the most part the gas bills are regularly and promptly paid.

The loss of the Company arising from the disastrous voyage of the bark *Rockhampton* is not fully ascertained, for although the goods were insured, the delay and detention has caused a loss of fully six months use of the new mains, and a further loss is occasioned by replacing the pipes thrown overboard, in addition also to the serious hindrance in erecting new retorts, and loss of interest on unremunerative capital.

Several interesting communications have been received from England, America, and New Zealand respecting the use of gas for cooking purposes, and the Directors are carefully watching for suitable opportunities to bring the best and most economical apparatus for cooking by gas before the Rockhampton public.

Since the report was prepared, the Directors sincerely regret to announce the demise of your respected Engineer, Mr. William Smith, whose death took place on Monday, the 17th of December. Arrangements are in progress for a suitable person to take charge of the works.

Dr.	Profit and Loss Account, for the Half Year ending Nov. 30, 1877.		Cr.		
Manufacture, distribution of gas, and management . . . . .	£910	2 4	Balance, May 31 . . . . .	£846	0 10
Discounts on gas-rents . . . . .	101	10 3	Sales of gas, coke, and tar . . . . .	2001	8 3
Bad debts written off . . . . .	17	12 0	Scrip and transfers . . . . .	1	18 0
Dividend, June 30 . . . . .	655	7 11	Rent of dwelling-house . . . . .	22	10 0
Reserve-fund . . . . .	210	12 10			
Wear and tear and depreciation . . . . .	150	0 0			
Profit this half year . . . . .	816	11 8			
	£2871	17 1		£2871	17 1

<i>Liabilities and Assets.</i>							
Capital . . . . .	£15,000	0	0	Fixed investment . . . . .	£12,943	15	
Less due and not called up . . . . .	1,975	6	0	Floating ditto, coal, coke, and tar . . . . .		440	14 10
	£13,024	14	0	Sundry debtors . . . . .		385	7 4
Unclaimed dividends . . . . .		16	16 8	A. J. S. Bank . . . . .		415	13 1
Reserve-fund, Nov. 30 . . . . .		17	3 4	Cash in hand . . . . .			0 8 3
Ditto, May 31 . . . . .		210	12 11				
Profit and loss . . . . .		816	11 8				
	£14,185	18	7		£14,185	18	7

The CHAIRMAN, in moving the adoption of the report, remarked that the Company were progressing steadily, and he hoped by next meeting to report the extension of works. Of the material consigned in the barque *Rockhampton*, some 70 tons had been landed in very fair order; the remainder, thrown overboard on the voyage out, was covered by insurance, so that little loss would be sustained. The Directors had secured the services of an Engineer (Mr. W. A. Stephen), in the room of Mr. W. Smith, their late Engineer, whose death was a matter of deep regret. From all accounts Mr. Stephen was a most suitable gentleman for the position.

Mr. LIVERMORE inquired what discounts were allowed to consumers.

The CHAIRMAN stated that 5 per cent. discount was allowed on monthly accounts under 10,000 feet, and 7½ per cent. on those over that quantity. The discounts showed a little over 5 per cent. on the gas sales, evidencing prompt payments on the part of consumers.

The motion for the adoption of the report was agreed to and the proceedings terminated.

#### COLLINGWOOD, FITZROY, AND DISTRICT (AUSTRALIA) GAS AND COKE COMPANY.

The Ordinary General Meeting of this Company was held on Wednesday, the 36th of January last, when the following report and accounts were submitted:—

In presenting this, their last report, to the Shareholders, the Directors offer their congratulations on the amalgamation of the three Gas Companies, the Bill for which received the Royal Assent on the 20th day of December last.

The increased value of the shares, and the prospect of business based on the conditions of the new Act of Parliament, will allay any apprehension that may have been entertained as to the desirableness of amalgamation by any Shareholder of this Company.

The interest of the Shareholders is now transferred to the Metropolitan Gas Company, and for every four shares held in this Company, seven shares will be issued by the Metropolitan Company, and instead of single share scrip, they will be put in such lots as may be required, on giving up the scrip now held.

It is intended as soon as possible to unite the business in one office.

The services of Mr. Scott (formerly Secretary to the City of Melbourne Company) have been retained as Secretary of the new Company, whilst Mr. Vasey (formerly Secretary of this Company) remains as Office Manager.

The works of the three Companies are being put into thorough repair, to meet the demands for winter. The Collingwood Company's works (henceforth to be called "Fitzroy Station") have been handed over in excellent order and condition, reflecting great credit on Mr. Wier, the Company's Engineer.

The accounts now presented show favourably with gas at 7s. 6d. per 1000. Whilst this price is charged to the public, the maximum rate of dividend to be paid will be 10 per cent.; for every reduction of 5d. per 1000 feet during the next five years, the rate of dividend may be increased by 1 per cent.

A dividend at the rate of 8s. per share is now recommended.

Dr.	Balance-Sheet, Dec. 31, 1877.				Cr.
Paid-up capital . . . . .	£100,000	0	0	Land, works, apparatus, ser-	
Debenture bonds . . . . .	50,000	0	0	VICES, METERS, &c. . . . .	£232,309 15 4
Interest on debenture bonds . . . . .	577	10	0	Material in store . . . . .	1,072 18 3
Sundry amounts owing by the				Coal in store . . . . .	2,460 8 1
Company . . . . .	3,674	2	11	Lime in store . . . . .	25 0 0
Wear and tear account . . . . .	9,560	13	10	Coke in store . . . . .	52 10 0
Bills payable . . . . .	9,499	3	10	Tar in store . . . . .	71 16 3
Reserve-fund account . . . . .	33,000	0	0	Sundry amounts owing for	
Insurance-fund account . . . . .	1,500	0	0	gas . . . . .	8,422 8 10
Contingent-fund account . . . . .	970	3	5	Sundry amounts owing for	
Dividends and bonuses un-				coke . . . . .	1,112 5 1
claimed . . . . .	45	11	0	Balance in bank . . . . .	404 13 6
Services and meters replace-				Metropolitan Gas Company . . . . .	1,403 5 2
ment account . . . . .	30,311	13	1	Cash in hand . . . . .	648 11 11
Profit and loss . . . . .	8,849	13	1	Amounts owing to the Com-	
				pany . . . . .	4 18 0
	£247,988	10	5		£247,988 10 5

#### Profit and Loss Account for the Half Year ending Dec. 31, 1877.

Coal carbonized . . . . .	£16,547 0 3	Gas-rates . . . . .	£33,116 8 6
Lime used for purifying . . . . .	547 0 0	Coke sold . . . . .	4,350 18 8
General charges—		Tar sold . . . . .	1,032 18 7
Allowance to Directors . . . . .	300 0 0	Ammoniacal liquor sold . . . . .	172 10 4
Allowance to Directors for services on Committee re-		Sales of sundry materials . . . . .	106 4 9
amalgamation . . . . .	192 3 0	Transfer fees . . . . .	6 5 0
Auditors fees . . . . .	15 15 0		
Officers salaries . . . . .	1,887 8 10		
Rent of offices . . . . .	200 0 0		
Rates and taxes . . . . .	309 1 8		
Law charges . . . . .	729 18 5		
Printing and stationery . . . . .	86 3 7		
Advertising . . . . .	21 12 2		
Wages—Storeman . . . . .	88 16 8		
Stokers . . . . .	2,298 15 0		
Labourers . . . . .	951 14 9		
Inspectors . . . . .	824 17 0		
Repairs . . . . .	273 14 3		
Lamp-lighting . . . . .	203 13 9		
Materials used . . . . .	603 10 9		
Cartages . . . . .	417 5 2		
Subscriptions to charities . . . . .	45 3 0		
Miscellaneous . . . . .	353 9 4		
Interest on debentures . . . . .	1,305 0 0		
Commission and interest . . . . .	369 5 9		
Bad debts and contingencies . . . . .	1,421 19 0		
Wear and tear . . . . .	745 13 9		
Balance . . . . .	8,045 16 9		
	£38,784 17 10		£38,784 17 10

Balance at credit of profit and loss, June 30, 1877 . . . . .	£5,803 15 7
Less amount to pay dividend declared July 20, 1877 . . . . .	5,000 0 0
	£803 15 7
Balance brought down . . . . .	8,045 16 9
	£8,849 12 4

The following interesting particulars concerning the manufacture of gas at the Company's works during the second half of last year has been prepared by Mr. J. Wier, the Engineer, under whose able superintendence the Fitzroy station of the Amalgamated Company has been placed:—

#### Particulars in the Manufacture of Gas at the Collingwood, Fitzroy, and District Gas Company's Works for the Half Year ending Dec. 31, 1877.

Coals used . . . . .	9,239 tons.
Shale used . . . . .	522 „
Total . . . . .	9,761 tons.
Gas registered through station-meter . . . . .	101,776,000 cubic feet.
Do. through consumers meters . . . . .	87,182,000 „
Tar made . . . . .	113,807 gallons.
Ammonia water made . . . . .	197,772 „
Since used . . . . .	10,970 bushels.

Average barometer, 3004; average thermometer, outside, 55°; gas, 72°. Gas leaves the works through 18-in., 15-in., 12-in., 12-in., and 12-in. pipes. Pressure, evening consumption, 40-10ths; other times, average, 15-10ths.

Length of cast-iron mains in use (2½ in. to 18 in.) . . . . .	120 miles.
Do. wrought-iron service-mains (1½ in. to 2 in.) . . . . .	40 „

Total . . . . . 160 miles.

In the above production of gas there is no allowance made for loss in main and service laying, nor for gas used at works, &c.

The reason that so high a pressure is used is in consequence of the distance the gas is sent, and that a large portion is forced over a rise of 90 feet above the works to 50 feet below the level of the works, and the rapid extension of mains and services, which has outgrown the present means of distribution.

There are about 15,000 meters in use.

Average production per ton of coal . . . . .	10,427 cubic feet.
Leakage and condensation . . . . .	12·3 per cent.
Retorts used (15 in. and 16 in.), 18 feet long, through and through.	

(Signed) J. WIER.

LIVERPOOL WATER SUPPLY.—From a report submitted by the Engineer to the Liverpool Corporation as to the state of the works at Rivington and the wells, it appeared that the total supply from the wells during the past year had been 1,439,157,622 gallons, and the average supply per day 3,953,728 gallons. The pumping-stations were generally in good order. The supply to Liverpool during the year had been without exception constant. The average supply per head per day for all purposes had been 22·83 gallons. This included 4·74 gallons per head per day charged by meter for trade purposes, and about 3 gallons per head per day for public purposes, and for trades charged by assessment, leaving 15 gallons per head per day as the consumption for domestic purposes, hotels, public-houses, warehouses, offices, and shops.



## ILKESTON GAS SUPPLY.

## LOCAL GOVERNMENT BOARD INQUIRY.

On Friday, the 8th inst., Mr. R. MORGAN, C.E., conducted an inquiry at the Town Hall, Ilkeston, upon an application made by the Ilkeston Local Board to the Local Government Board for a Provisional Order to empower them to take a transfer of the works and undertaking of the Ilkeston Gas Company.

Mr. LEECH, Solicitor to the Local Board, opened the case. He said the Gas Company were formed in the year 1848, when Ilkeston was a very small place, and the Company were equally small. They started with a capital of £2000, which was afterwards increased by £500. In the year 1864 the Local Board were formed, and from that time up to 1876 there were many complaints as to the mode in which the gas was supplied to the town. The Board erected public lamps, and made all necessary arrangements, but frequently the Company showed themselves unequal to meeting the requirements of a progressing district like Ilkeston. Not only were there grievances as to the defective nature of the gas, with respect to its want of purity and illuminating power, but in many instances the Company did not feel it to be worth their while to supply gas at all. They were making large profits; these they divided to some extent, but there were many things done which, instead of being paid for out of capital, were met out of the profits. As he had said, the Company did not care to supply small consumers, and this fact, coupled with the quality of the gas, created great dissatisfaction, which culminated in 1876 in a memorial from the gas consumers to the Local Board, praying the latter to take over the works of the Company, under powers to be obtained for that purpose. That, he might say, was a spontaneous act on the part of the consumers, not being fomented or encouraged by the Board in any way. On the 29th of December, 1876, a public meeting, which was largely attended by the ratepayers, was held in the Town Hall, and the expression of opinion then was almost unanimous that it would be advisable to carry out the prayer of the memorial. A poll was demanded, which took place on the 22nd of January, 1877, the result being that 1497 persons voted for the taking over of the works, and 261 against, there being thus a majority of 1236 in favour of the movement. After the meeting, negotiations were opened between the Company and some members of the Local Board, for the purpose of taking over the undertaking of the Company, and an understanding was arrived at, which, however, was not ratified by the Shareholders of the Company. The understanding was that the Local Board should take over the works at £12 per share, which would amount in the aggregate to £18,636. That was a very delusive mode of arriving at the value, because the capital seldom represented actually the value of the property. When Mr. Stevenson, on behalf of the Board, and Mr. Loam, on behalf of the Gas Company, went over the works to ascertain their structural value, the results were within a pound one of the other, although they were strictly independent. These estimates put the structural value at over £14,000; and then there was the important item of goodwill to be considered, which did not seem to be provided for by the £12 per share. When the latter proposition was made to the Shareholders it was voted by more than two to one. It was certain that in the £18,000 not a shilling of prospective value could have been reckoned. He had gone carefully into this matter, and being fortified by Mr. Stevenson's statement, he was certain that such could have been the case. The sum that was subsequently agreed upon—£25,000—seemed to be a fair and reasonable one as between seller and purchaser. The first negotiations having been voted by the Shareholders—which, he repeated, was a very wise act—the matter fell through. Thereupon the Company went to Parliament in the session of 1877, under the auspices of the Board of Trade, for the purpose of extending their powers with regard to capital. They put their share capital at £12,048, and asked power to raise a further considerable sum. That was opposed by the Local Board, and a petition was forwarded to the Committee of the House of Lords on the subject. The petition stated that the supply of gas to the town of Ilkeston had long been unsatisfactory, and was a subject of general complaint, the quality of the gas being bad, and the price charged very high; further, many inhabitants had not been able to obtain a supply, and where the gas had been lighted it had frequently gone out; the public lamps had also been inadequately supplied. The fact was that the town had gone on increasing rapidly, and there had not been that spirit of enterprise on the part of the Company that might justly and reasonably have been expected. On the 20th of June the Company appeared by their Counsel before the Committee of the House of Lords, and the way in which the Committee treated the question was, no doubt, the cause of the negotiations being re-opened for the sale of the works. That culminated in a provisional agreement that the sum of £25,000 should be paid for the works and plant, and a sum, not exceeding £500, for the costs of the Company's application to Parliament. This agreement was dated the 25th of June, 1877, and was agreed to by both parties. About the last item—the £500—there was a slight difference, which was not yet settled. The course pursued in the House of Lords was this: He did not mean to say that the Committee openly encouraged the transfer, but they facilitated it by adjourning the inquiry to allow the arrangements to be completed. The inquiry was accordingly adjourned for a week or ten days, and, in the meantime, a preliminary agreement was entered into. Afterwards a public meeting was called, the terms of the agreement were ratified, the document was signed, and had the seal of the Board affixed to it on the 4th of September, 1877. With regard to the £500 to defray the costs of the application, there was this little hitch. The costs had exceeded this sum by a few pounds—something like £40 or £50—and the Company insisted that the clause should be altered to cover the total amount; therefore, if the clause was altered so as to read "a sum not exceeding £600," there would be no difficulty about it. On the 5th of November, 1877, the Local Board presented the memorial to the Local Government Board for this Provisional Order. With regard to the price the Company had agreed to take, and the Board had agreed to give—£25,000—there would be the question as to whether or not the Board, by paying this sum of money, could work the business at a profit. The Inspector would hear from Mr. Stevenson that the Company had done exceedingly well in a pecuniary sense, and had done so although there had been considerable mismanagement. He said that, by the outlay of £3000 or £4000, at least £1500 a year could be earned. Thus at once they could make a profit, charging a reasonable rate for the best description of gas, of at least 5 per cent. He then proceeded to speak of the population in Ilkeston between 1871 and 1878, and of the increase in the number of houses. What spoke even more loudly for the progress of the town was, that in 1871 there were 160 or 170 uninhabited houses, and now it would puzzle anybody to find one. Within the last few years, too, a line of railway had been promoted, with which, he was proud to say, he had something to do. It ran from a place called Awsworth Junction, forming a connection with Nottingham, Grantham, and London, then proceeded through Ilkeston, where there was a first-class station, to Derby, where it crossed the town to a station in the principal thoroughfare, and so on to Burton-on-Trent. The line was opened a few weeks ago for goods traffic, and next month it would be opened for passengers. It was impossible to say what effect this line would have upon the development of the resources of Ilkeston, which were most valuable and prolific. He trusted that the

result of the inquiry would be that the Local Board would take over the gas-works on the terms mentioned.

Mr. Wm. Wade, Chairman of the Local Board, said he was acquainted with the formation and history of the Gas Company. They had supplied gas to the town, and there had been great dissatisfaction as to the supply. Last year the Local Board took over the Water Company. The Board had a memorial in 1875, signed by over 150 of the inhabitants, praying the Board to take over the gas-works. The Board had no interference in that memorial. Upon this a public meeting was called to discuss the question. The meeting was held on Dec. 29, 1876, and the resolution to take over the gas-works was carried, with one dissentient. A poll was demanded, which took place in January, 1877, the result being as already stated. The meeting was called to oppose the Company's application to Parliament for extended powers. After that negotiations ensued between two or three members of the Board and one of the Directors of the Company, and an agreement was made that £12 per share should be paid. When that was brought before the Shareholders in March, it was vetoed by two to one, and the Company went on with their application to Parliament. He was present at the inquiry before the Committee of the House of Lords, which ended in a preliminary agreement between the Board and the Company to take over the works for £25,000, and a sum not exceeding £500 for costs. He did not think there was any dissatisfaction in the town as to the terms, and he believed the inhabitants were generally pleased at the prospect of the Board taking the works. The Company were formed under a deed of settlement, and had no parliamentary powers or obligations. As a matter of fact, the Company had refused to supply some consumers. He himself had been put to considerable inconvenience by the want of purity and illuminating power in the gas.

The Inspector asked if there was anybody present representing the Gas Company, and a gentleman present said he and another in the room were Shareholders in the Company. They were not dissatisfied with the bargain.

Mr. W. Lissett, Clerk of the Ilkeston Local Board, confirmed the Chairman's statement, as to the dissatisfaction expressed with regard to the operations of the Company. He was present at the inquiry before the Committee of the House of Lords. He thought that £25,000 was a proper sum to pay for the works as a going concern.

Mr. LEECH: Do you think that the works could be made capable of meeting the requirements of the district?

Witness: I feel confident that they could.

Mr. LEECH: Have you heard general dissatisfaction expressed with regard to the present supply?

Witness said he had. So far as he knew there was no opposition on the part of the Shareholders. The Local Board had just taken over the water-works, and the deed of conveyance was being prepared. In the interest of consumers, as well as of the ratepayers, it would be a good thing for the Board to take over the gas-works.

Mr. George Wilson Stevenson, C.E., said: I am an engineer at Westminster, and have been in practice more than 30 years. During that time I have paid much attention to gas and water works, and have been concerned in many transfers of these to local authorities. I was consulted by the Local Board of Ilkeston when the Gas Company made their application to Parliament. I then made a careful examination of the works both as to their structural and commercial value. Mr. Loam, Consulting Engineer, of Nottingham, also prepared a structural valuation, and we communicated the results to each other. The valuations were made quite independently, and the result was that my valuation came out £14,303, and Mr. Loam's £14,304—such a near conclusion as I never before experienced. Looking upon this as a going concern, having a monopoly of the district, a considerable sum should be added for the goodwill. The purchase of a gas undertaking is never made upon the structural valuation. The object of the valuation is to ascertain whether the capital is represented by the works and plant. I found in this case that it was more than represented, showing, in fact, that the Company had been increasing their plant out of the pockets of the consumers instead of their own. £25,000 is, in my opinion, a fair and proper sum to pay for the purchase of the works. I think the Local Board would get the undertaking on very cheap terms. In my opinion they were quite justified in opposing the Company's application to Parliament, because if the Company had been successful they would immediately have obtained their share capital of £12,000 entitled to 10 per cent., and being a statutory Company they would have got 25 years purchase, which would have amounted to more than £30,000. I think the Board made an excellent bargain, which was mainly brought about by their opposition to the Company obtaining statutory powers. I found the works very defective, working with iron retorts, and an exhaustor was not employed. The consumption of coal was very large, much larger than it need be. The gas unaccounted for was very great. The leakage of the gas was nearly 5 million feet, or 23-25 per cent. of the whole quantity. The consumption of coal was over 2000 tons. On £25,000 there would be a profit of £1406. In this I have taken the sale of 8500 feet per ton, which is a moderate estimate. Upon that standard I have ascertained the tonnage of coal required, and the expense of labour and management, and so on, and brought out the total profit at £1406, as against £1167 which the Company made. I have excluded, of course, all balances brought forward and sums paid for dividends, and I have excluded also any sum paid to Directors. Putting the cost at £30,000, that would represent 21 years purchase on the profits of 1877, and with this further capital expended upon the works there would be an increase of operations and a larger profit. I am of opinion that there is plenty of room in the place for increase of business. It is a mineral district, and up to a certain point there will no doubt be an increase of population.

The INSPECTOR: Will there be any purchase of land required?

Witness: There is abundance of land, and the buildings do not require extension. The iron retorts want taking out, and clay substituting. Several other little matters also require attention. The expenditure will be covered by the difference between £25,000 and £30,000, including the cost of the Provisional Order.

Mr. LEECH: Four and a half per cent. on £30,000 would be £1300 a year. Are you of opinion that if these alterations are made, the profits would be £1500 a year?

Witness: I do not know whether you will borrow at 4½ per cent. I have reckoned it upon that, however.

Mr. LEECH: We shall try to get it at 4 per cent.

Mr. Stevenson: £195 a year set aside at compound interest will extinguish the debt in 50 years, and the works will then be the property of the ratepayers. If the Local Board please, they may pay the sinking-fund out of the profits from the gas, but as the ratepayers are purchasing the works by instalments extending over 50 years, it seems better that the £195 should come out of the rates. In the interest of consumers, as well as the ratepayers, it is most desirable that the Local Board should take over the works. If the Company had been successful in their application, they would have raised new capital at 7 per cent., and the Local Board will get their money at 4 per cent.; so that the saving to the consumers will be the difference between these figures. I think it is desirable that



all works that affect the streets should be in the hands of the local authorities. I believe that the new line of the Great Northern will have some effect in developing the resources of Ilkeston.

In answer to the Inspector, Mr. LEECH suggested that it would be better to alter the clause respecting the costs to "a sum not exceeding £600," £550 would cover the amount.

The Inspector: That would be the simpler way of dealing with the matter. If you delay, you may lose the session.

Mr. LEECH intimated that he would call a special meeting of the Board to consider the alteration, and would forward the decision to the Inspector, that he might embody it in his report.

The inquiry then terminated.

### EXTENSIONS AT THE DARLINGTON CORPORATION GAS-WORKS.

On Saturday, the 9th inst., the members of the Darlington Town Council assembled, by invitation of the Chairman of the Gas Committee (Alderman Kitching), to pay a visit of inspection to the new gas-works, which have just been completed, on the left bank of the Skerne, opposite to the old works, with which they are connected by a bridge over the river. After the inspection, the civic party were entertained at luncheon by the Chairman, who has been at the head of the Gas Department for more than 20 years, and who took the present appropriate opportunity to give a somewhat detailed account of the progress of gas lighting in the borough. The substance of his remarks will be found in the following extracts from a local contemporary:—

The gas-works of Darlington were originally erected by a Mr. West, who built the apparatus at his own cost, and carried them on as a private speculation. On the 11th of November, 1830, the town was first lighted with gas. In the year 1846 a number of gentlemen in Darlington formed themselves into a company, and purchased the works from Mr. West. In the year 1849 the Company applied for an Act for the exclusive supply of gas to Darlington and its suburbs.

In 1854 the Darlington Local Board of Health obtained an Act which authorized them to purchase the gas and water works, and borrow to the extent of £59,000. The gas-works appear to have been well managed in this early part of their history, and to have yielded a large dividend to the Shareholders. The works had only been nine years in the hands of the Company, when the Local Board of Health thought that the gas supply should be in their hands, and that they would be a good investment for the ratepayers. They had no sooner made up their minds to this course than they negotiated with the Company for their purchase. Fortunately for the Local Board, the gentlemen who were at the head of the Gas Company took a deep interest in the welfare of the town, and handed over the works to the Local Board at a reasonable price.\* In 1854 the price charged for gas was 5s. per 1000 cubic feet, and this price was not altered in any way up to the year 1860, with the exception of the year 1855, when a charge of 5s. 6d. per 1000 cubic feet was made. In 1861 the price was 4s. 8d. per 1000 cubic feet, and from that time to the present the price has gradually been reduced, and is now 3s. per 1000 cubic feet net, with 8d. per 1000 discount if the bills are paid in one month.

At the time of purchase the annual make of gas was 18,002,000 cubic feet, and in the year 1864 the annual make of gas was 36,765,000 cubic feet, or more than double what was made in 1854. This extraordinary increase in the demand for gas necessitated the enlargement of the works, and the main-pipes in different parts of the town. In order to carry out those extensions properly, the Local Board called in Mr. George Emmott, Gas Engineer, and under their directions Mr. Emmott carried out what was considered to be necessary to ensure a good supply of gas to the town. At the time Mr. Emmott was called in, the Company manufactured all the gas in small round retorts of 12 inches in diameter. Mr. Emmott was of opinion that this was not a profitable mode of carbonizing coal, and he had them replaced by the large and small ovens now in use, which have given entire satisfaction. The purifying apparatus was at the same time considered insufficient, and, in carrying out the extensions, the Local Board had the apparatus greatly enlarged, for the purpose of being able to manufacture and purify a much greater quantity of gas, to meet the growing demand. But, from the year 1864 to 1874, the increased demand for gas was much greater, and out of all proportion to what it had been in any previous ten years of the gas-works history. In 1864, as before stated, the quantity of gas made was 36,765,000 cubic feet, whereas in 1874 it had reached the large figure of 93,674,000—showing an increase for the ten years of 56,909,000 cubic feet, or 154 per cent. This was a much greater increase than had been anticipated; and it was again found necessary to make further extensions. The 10-feet purifiers had again to be replaced by four purifiers, two 16 feet square, and two 20 feet by 16 feet; and two large scrubbers had to be erected to cleanse the gas from ammonia. It was also found necessary to erect a new set of condensing apparatus; a new engine and exhauster, to pass 40,000 cubic feet of gas per hour; and a new station-meter. The small gasholders then in use were found quite insufficient for storing the gas, made during the day to supply the town with at night, and they were replaced by two large telescopic gasholders, capable of storing 326,000 cubic feet. In order to carry out these extensions, the Corporation purchased a small piece of land on the west side of the present works, from Mr. John Pease, on which they erected a gasholder and additional retort-house.

The increased demand for gas proceeded at such a rapid rate during those ten years, that the original site of the works was completely filled up with the extensions that had been made from time to time in their plant, and the Gas Committee saw that in order to meet the wants of the consumers they would require an additional quantity of land, and a large increase in their manufacturing apparatus, to provide for this increased demand. They accordingly purchased about 3½ acres of land on the east side of the Skerne, adjacent to the present works, and erected apparatus capable, at the present time, of manufacturing 120 million cubic feet of gas per annum. By enlarging the retort-house, the Gas Committee could manufacture and purify double the quantity at present required for Darlington. It will thus be seen that the duties of the Gas Committee for the last 20 years have been of an arduous nature. In 1850 the gas made was 11,228,500 cubic feet; in 1877 the gas made was 117,521,000 cubic feet, or nearly eleven times what was made in 1850.

But the extensions at the works did not embrace all that the Gas Committee had to look after. They had from time to time to take up small and lay down larger mains, and extend these mains from time to time as the town increased. The principal gas-mains in the town at the present time are capable of conveying double the quantity of gas that is now required. Alderman Kitching, the present Chairman of the Gas Committee, was one of the promoters of the Gas Company 32 years ago; and from that time to the present he has taken a deep interest and prominent part in the management, and to him, in a great measure, may be attributed the success and prosperity of the concern.

The following table shows the increase in the demand for gas from 1850 up to the present time:—

\* The price paid by the Local Board was at the rate of £200 for each £100 of share capital.—Ed. J. G. L.

Year.	Number of Retorts in Action.	Gas made per Annum in Cubic Feet.	Increase per Cent.	Decrease per Cent.	Coals used in Tons.	Price Charged by 1000 Cubic Feet.
1850	38	11,228,500	—	—	1,216	—
1851	27	14,297,400	27·33	—	1,608	5s. 0d.
1852	18	16,896,700	18·18	—	1,736	5 0
1853	18	17,363,000	2·75	—	1,909	5 0
1854	24	18,002,000	3·68	—	2,050	5 0
1855	34	21,242,000	17·99	—	2,448	5 6
1862	30	27,846,000	31·08	—	3,289	4 2
1863	30	31,377,000	12·68	—	3,261	4 2
1864	30	36,765,000	17·17	—	3,832	4 2
1865	36	41,950,000	14·10	—	4,198	{ 4 2*
1866	30	39,805,000	—	5 11	3,992	3 8
1867	36	44,622,000	12·10	—	4,492	3 8
1868	42	49,786,000	11·57	—	4,972	3 8
1869	42	54,685,000	9·84	—	5,470	3 8
1870	48	58,757,000	7·44	—	5,876	3 8
1871	48	67,267,000	14·48	—	6,727	{ 3 8*
1872	54	70,416,000	4·68	—	7,120	{ 3 2*
1873	66	84,051,000	19·36	—	9,095	{ 3 6†
1874	76	93,674,000	11·45	—	10,000	3 8
1875	81	100,167,000	6·93	—	10,009	3 6
1876	87	113,248,000	13·05	—	10,925	3 2
1877	97	117,521,000	3·77	—	11,870	3 0

\* Ending June.

† Ending December.

The new retort-house is 163 feet long, 54 feet wide, and 21 feet high to the spring of the roof. It contains 120 retorts, capable of carbonizing 60 tons of coal per day, or producing 600,000 cubic feet of gas. This was about equal to the capacity of the old retort-house, but the new building is so constructed that, should the demand for gas require it, it can be increased to double its present size. The new gasholder will be capable of storing 392,700 cubic feet of gas, or equal to two-thirds of one day's make in mid-winter. The pressure of gas is regulated by means of very effective governors, and, by means of a 14-inch connection between the old works and the new holders, could be filled from either works.

The cost of the new works up to the close of last year was as follows:—Retorts (120), £3710 11s. 10d.; boundary wall, £661 10s.; condensers, £782; engines and boilers, £946 11s. 5d.; station-meter, £570; gasholder and tank, £7546 3s. 7d.; land, £3089 12s. 2d.; new meter-house, offices, purifying-house, &c., £5167 9s. 9d.; purifiers and scrubbers, including pipes, £2878 2s. 5d.; retort-house and chimney, £3866 3s. 10d.—total, £29,218 5s.

In conclusion, the Chairman congratulated the Corporation and the town on the completion of such handsome works—works second to none—and which had been constructed under the direction of the Committee and their excellent Manager, Mr. Smith, without a penny having been paid as commission for the assistance of any Engineer whatever.

After the address of the Chairman, the Mayor of Darlington (Mr. Fay) proposed the health of Alderman Kitching, thanking him for his interesting information, and congratulating the Gas Committee that gas-making in their hands had proved to be a profitable operation. They had now something handsome in the bank for the ratepayers, in the shape of gas and water profits, and he hoped the Chairman of the Committee would live to see, in more prosperous times, a fund accumulate from the production of the new works, and have a word in the spending of it. Alderman Kitching appropriately acknowledged the compliment paid to him. The Ex-Mayor (Mr. Plews) complimented the Gas Committee upon the success of their undertaking. The members of the Town Council had frequently been rather hard upon the Committee, but they had successfully completed their works. They had been wonderfully lucky in obtaining the services of an excellent Manager, and he had great pleasure in proposing the health of Mr. Smith, the Manager. Mr. Smith returned thanks, and sundry other toasts followed, and were heartily responded to.

### HEREFORD CORPORATION GAS SUPPLY.

At the Meeting of the Hereford Town Council, on Thursday, the 7th inst.—the Mayor (Mr. W. Stallard) in the chair—the following report of the Gas Management Committee was presented:—

We lay before the Council the accounts made out by the Accountant, Mr. Capner, showing the results of the working for the past year, and his report accompanying the same.

From these it will be seen that the sum of £3604 now stands to the credit of the net revenue account, and the Committee have, out of this, repaid to the City Treasurer the sum of £452 2s. 5d., being the aggregate amount of the sums previously advanced out of the city funds for the purpose of carrying on the gas-works.

The following comparative statement of results arrived at will, no doubt, be interesting:—

	For Year ending Dec. 31, 1876.	For Year ending Dec. 31, 1877.	Increase.	Decrease.
Coals carbonized, tons. . . . .	5,123	5,169	46	
Gas produced, feet. . . . .	53,629,000	54,194,000	565,000	
Gas lost or unaccounted for . . . . .	5,683,326	5,962,500	279,174	
Average make of gas per ton of coal carbonized. . . . .	10,466	10,484	18	
Maximum quantity made in 24 hours . . . . .	282,000	271,000	—	11,000
Maximum quantity delivered in 24 hours. . . . .	293,000	301,000	8,000	

The average illuminating power of the gas during the past year has been equal to 14·56 standard sperm candles, consuming at the rate of 120 grains per hour in comparison with Sugg's new "London" standard Argand burner, consuming at the rate of 5 cubic feet of gas per hour.

We have considered the report of Mr. Stevenson with reference to the proposed increase of the works, and particularly as to the question whether it will be desirable to retain them upon the present site or to remove them, and the majority of the Committee are of opinion that it will not be desirable to incur the expense of a removal.

The following is the Auditor's report with the accounts appended thereto:—

Hereford, Feb. 25, 1878.

The Committee, Hereford Corporation Gas-Works.  
Gentlemen,—Agreeably with your instructions, I have audited the Corporation gas accounts for the past year, and now beg to hand you statement of same.

On comparing the results with those of the previous year (1876), it will be seen that the business has been conducted at an increased profit, but in consequence of the reduction made of about £205 on account of "public lights," and a discount of £279 8s. 11d., allowed to "private consumers," the surplus balance added to new account, 1878, is £1199 8s. 9d., as against £1428 8s. 11d. in 1876, making the total of surplus balance carried forward £3604 16s. 6d.

The low price at which coke has been sold for some months past has also affected the



receipts unfavourably, but this decrease has been more than counterbalanced by increased profits under other heads, as shown in the supplementary accounts.

One encouraging feature in the year's transactions has been the increased demand for gas by private consumers, the rental under this head showing an increase of £190 12s. 11d., a result full of promise for the future.

Having thus drawn your attention to the most important feature of the accounts, I do not deem it necessary to trouble you with further details.

(Signed) J. W. CAPNER.

*Dr.—Capital Account, Dec. 31, 1877.*

To Loan, 1872, repaid to July 4, 1876.	£3,856 18 7
Do., 1872, further repaid to July 5, 1877	1,075 1 11
Do., 1875, repaid to July 4, 1876.	50 0 0
Do., 1875, further repaid to July 5, 1877	50 0 0
	£5,032 0 6
Balance unpaid	51,467 19 6
	£56,500 0 0

*Cr.—Capital Account.*

By Cost of works and expenditure to Dec. 31, 1876	£55,712 11 11
Subsequently expended	116 13 2
	£55,829 5 1
Balance	670 14 11
	£56,500 0 0

*Dr.—Profit and Loss Account, for the Year ending Dec. 31, 1877.*

To Coals consumed, cost.	£3,287 12 3
Purifying	118 0 11
General repairs—wear and tear	784 8 9
Repairs to mains and services	26 3 4
Lamp-lighting and repairs	245 14 5
Gas-making—wages	701 5 7
	£5,163 5 3
Salaries	£335 15 0
Rates, taxes, and insurance	400 8 11
Stationery, printing, &c.	57 12 8
Law expenses	2 0 7
	795 17 2

Total expenditure

	£5,959 2 5
Net revenue account, balance transferred	4,634 6 1
	£10,593 8 6

*Cr.—Profit and Loss Account.*

By Gas-rental for public and private lights for twelve months.	£9,465 12 6
Special contract, and bad debts recovered	4 11 7
Residual products (less cartage and expenses)	£611 14 10
Tar, coke, liquor, &c.	378 3 5
	989 18 3
Fittings, &c., profit thereon	113 8 7
Abatements	19 17 7
	£10,593 8 6

*Dr.—Net Revenue Account.*

To Interest paid on mortgage to June 30, 1877	£1,136 6 9
Ditto accrued and owing, Dec. 31, 1877	1,112 8 11
Ditto paid on additional loan of £1500, June 30, 1877	£31 0 7
Ditto ditto, Dec. 31, 1877	29 19 2
	60 19 9
Loan redemption-fund, amount transferred to credit account	1,125 1 11
	£3,434 17 4
Balance, surplus to new account, 1878	3,604 16 6
	£7,039 13 10

*Cr.—Net Revenue Account.*

By Balance brought from last account	£2,405 7 9
Ditto brought from profit and loss account, being profits for twelve months to Dec. 31, 1877	4,634 6 1
	£7,039 13 10

*Dr.—Loan Redemption-Fund.*

To Cash paid—instalment on loan, 1872.	£1,075 1 11
Ditto—ditto, 1875	50 0 0
	£1,125 1 11

*Cr.—Loan Redemption-Fund.*

By Net revenue account—balance transferred	£1,125 1 11
	£1,125 1 11

*Dr.—General Balance-Sheet.*

To Capital account, balance unexpended	£676 14 11
Sundry tradesmen and others, amounts due from coals, fittings, &c.	899 3 7
Interest accrued and unpaid mortgage to Dec. 31, 1877.	1,112 8 11
Amount due to Treasurer	72 15 7
	£2,751 3 0
Net revenue account, balance at credit	3,664 16 6
	£6,358 19 6

*Cr.—General Balance-Sheet.*

By Amount owing to debtors for gas and meter rental, including the quarter's rental ending Dec. 31, 1877	£3,091 5 3
Less deposits received	36 0 0
	£3,055 5 3
Debtors, for residuals, viz.—	
Coke	£391 1 3
Tar	124 13 8
Lime	9 13 7
Liquor	28 12 6
Fittings	269 12 0
	825 13 0
Stock of material on hand, viz.—	
Coals	£268 10 6
Fittings and general stock	536 18 0
Purifying material	86 5 0
Coke	50 14 0
Tar and ammonia	20 0 0
Gas	4 13 0
	967 0 6
Cash on deposit at bankers.	1,500 0 0
Interest allowed by ditto	11 0 9
Cash in hands of manager	—
	£6,358 19 6

Mr. SHELLARD moved the adoption of the report. He reviewed at some length the history of the gas undertaking, and expressed his conviction that the future increase in the demand for gas would be much less than it had been in past times. Mr. Stevenson's recommendations were based on the assumption that the present consumption would be doubled in 14 years; but, in his (Mr. Shellard's) opinion, at least 30 years must elapse

before such a result was arrived at. Moreover, it did not follow that double the consumption of gas meant gas-works of double the size. There were several important parts of the works which would not necessarily require doubling. Was there any one unscientific or bold enough to say that in the next 30 years science would not have discovered some improved system of making gas, or to deny the possibility that as gas snuffed out candles, so electricity would snuff out gas? He had faith in the discoveries of science, in the advancement of electrical discoveries and appliances, and 30 years was quite far enough ahead to look. At the present time the Corporation were loaded with a debt of £51,500, in round numbers, of the unpaid annuities for the gas-works. Mr. Stevenson had estimated the cost of removing the gas-works to the proposed new site at £25,800, and in that amount he did not include new mains, which were calculated at £400, nor was anything said about central offices in the city, and other matters of detail, which all meant the expenditure of a considerable sum of money. Instead of £25,800, the cost of removal would be more like £30,000, and that, with the existing debt, gave a total of £81,500. It was not fair to the present consumers and ratepayers to load them so heavily to the relief of posterity. He was proud to know the profits of the works had been very large, that it was a good speculation on the part of the Corporation to buy them, that it was still a highly remunerative property, and that it would pay very handsomely; and he would not say that they might not lay out this money on the works without increasing the taxation of the city. But, admitting that they could spend the money without increasing the taxation of the town, was that any reason why they should not try and reduce the taxation? Was there any reason for continuing the high price of gas if they could reduce it? Let the present generation have some of the benefit of the undertaking. The recommendation of the Committee, that it was not expedient to remove the works, was based upon indisputable argument, and he asked them to confirm that recommendation, believing they would in so doing be acting justly towards themselves and generously towards those who were to come after them.

Alderman CARLESS seconded the motion, remarking that when the Corporation bought the works, better and cheaper gas was promised. How far was that promise fulfilled? Certainly not as regarded the price, for gas was 3d. per 1000 feet dearer. What benefit had the consumers—for it was the consumers more than the ratepayers generally who were concerned—derived from the transfer of the works to the Corporation? Those who advocated the transfer were surprised at the large amount of money awarded by the arbitrator; but if they had been told that in five years time they would want to lay out another £30,000 on them, it would have surprised them still more. It was a very profitable investment, no doubt, if the works were carried on judiciously, but how were the consumers to derive any advantage if they were made to yield such a profit? Or how would they benefit if there was a reckless expenditure of money upon them? Looking at the enormous debt that still hung over the works, and at the proposal to spend several thousands of pounds more on them, it was not clear to him how there was going to be any reduction in the price of gas. He granted that posterity might reap some advantage, but that was not the only point to be considered. His own opinion was, that they would derive all the advantages by increasing the present works. In 10, 15, or 20 years the consumption of gas might be greater, but there was no certainty about it, therefore it would be unwise to remove the works from their present situation. As to their liability to be flooded, he had never known Hereford in darkness from that cause.

Alderman ANTHONY moved, as an amendment—"That it is inexpedient to spend more money upon the present works." He expressed his surprise at the meagreness and unsatisfactory character of the report of the Committee. It was a mere negative to the proposition to remove the works, but it left totally untouched the question of whether it was desirable to lay out £14,000 or £15,000 on them where they stood. In fact, the Council were left in the dark. He would ask the Committee whether they proposed to lay out £14,000 or £15,000 on the present works? To do so would be a great mistake; but if they were to stay there, they must make such an outlay.

Mr. RALPH seconded the amendment in a long speech, in the course of which he expressed his opinion that it would be wrong to expend a large sum of money upon the old works. He believed that, having consulted a competent man to advise them, the best thing the Council could do was to follow his advice.

Mr. SMITH said he considered the consumers should be allowed to share some of the advantages derived from the profitable character of the works, and should not have to pay more than other towns were paying; and not only the consumers, but the ratepayers, who paid for the public lamps, ought to get some benefit from a reduction in the price of gas. It was all very well to be able to show a large balance; but it was hardly the thing to get it by overcharging the consumers of the gas. He therefore opposed the construction of new works, on the ground that the increased consumption of gas did not justify the expenditure, arguing that they could not rely upon the same increase in the future as had taken place in the past. Before the Council decided upon new works, a public meeting of the ratepayers ought to be called. The old works, with £14,000 well expended on them, as no doubt it would be under the supervision of the Committee, would be adequate; and, holding that view, he should vote for the adoption of the report.

Mr. BOWERS supported the amendment, believing the Council should be guided very much by Mr. Stevenson's report. It was useless to obtain the advice of a professional man and then ignore it.

Mr. JAMES remarked that if the question of erecting original works came before them, no one could propose erecting them where the present works stood. But there they were, and the question was, were the advantages to be derived from the expenditure of £14,000 sufficient to compensate them for the outlay? On the other hand, with regard to the larger sum, he was not aware that a large expenditure of money was the best economy, and he should dissent from the proposal unless there was to be some great beneficial and profitable result to the ratepayers, and equivalent to the expenditure. With regard to the question of whether it was necessary to remove the works or not, it turned on the question whether the demands upon the works would be doubled, or would be likely to be doubled, in any such period as 14 years. Mr. Stevenson had given his opinion. He was a competent gentleman, and had given his best opinion, and there was no imputation upon his honour or veracity. At the same time, his opinions were merely the result of an average based upon other towns. If they had any local knowledge of the requirements of the city, they should bring it to bear upon the question. At the last meeting he brought forward a statement as to the production of gas for the last 17 years, and he would now invite them to follow him in one or two points with those figures. In the first four years of those 17—1860-63—the consumption of gas increased 4,311,000 feet, equal to a total increase of 21 per cent. During the last four years of the same period the consumption increased 6,410,000 feet, or an increase of 13 per cent. This clearly showed that the increase was not going on at the same ratio as formerly. Again, in the ten years previous to 1864 the consumption doubled itself; but in the 13 years which had elapsed since, it had not doubled itself. In the 14 years ending 1876 the increase was 30,935,000 feet; but in the 14 years ending 1877 it was only 29,731,000 feet. Looked at in any way, these figures showed that the



increase of gas during the recent period was nothing like so rapid as it was during the prior period, and nothing to justify the inference of Mr. Stevenson that the consumption was going to increase to double its present amount in 14 years, or anything like it. What it would increase was a matter of speculation and theory. As to the result of the expenditure of £14,000 on the present works, it appeared to him they would have triple the storage capacity as compared with what it was now, and double the producing power. The result would be the same in regard to the alternative scheme; they would have double the capacity, but they would spend £25,000 instead of £14,000, and that would enable them to provide for prospective requirements. That being so, he did not see why they should saddle themselves with the heavier expenditure whereby to meet theoretical and problematical requirements, which do not now exist, and might not, perhaps, exist for a long period. With regard to the taxation of the citizens, the money must be paid by them somehow, either in rates, or by keeping up the price of gas. Perhaps it would be better to pay it in rates, instead of keeping up the price of gas, and then the consumers would not be unfairly burdened. If the works were profitable, and yielded a large surplus, there was no reason why some of that surplus should not be applied in reducing the rates or the cost of gas, as well as in reducing the existing debt. The question of whether the purchase of the works was a good or bad stroke of business had nothing to do with the present matter. He knew now he made a mistake when he opposed the purchase, and he did not shrink from saying so. He was very glad the Corporation did buy the gas-works; but he must remind them that they were perfectly in the dark then as to what the profits were likely to be, and he dreaded the effect of an arbitration in the dark. And though he was glad now the works were bought, he was not ashamed that he was in the minority then. With regard to the precedent at Gloucester, they were compelled to move in that case; they had no choice. Mr. Ralph had suggested that a reduction had been made in the price of gas in this way—that while they were paying a higher price than they used to, the quality was better. He was sorry he could not accept that proposition, because they paid 3d. per 1000 feet more than they did, and the only difference in the quality was that last year the illuminating power was 14·33 candles, and this year 14·56. It was, therefore, certainly not cheaper. He could not, consistently with the ideas he had formed, vote for the expenditure; but if the majority of the Council thought otherwise, he should personally be very much pleased.

Alderman BOSLEY said there was one thing left out of the calculation, and that was the cost of a siding at the old works, which would be about £1200, and would bring the total up to more than £15,000. In the purchase of the new works they were not necessarily obliged to lay out the £25,000 all at once. Further, a large sum was included in this estimate for roads, drains, &c. Now roads and drains existed already, so that these items should be eliminated. Taking, then, the amount at £20,000, the interest on that at 4 per cent. would be just £800; on the £15,000 it would be £560. The difference, therefore, or in other words, the actual cost to the citizens, would be only £240. Against this sum they had to set the sum that Mr. Ralph pointed out would be saved in the carriage of coal—namely, £160 annually. As to the benefit of the works to the city, if the price of gas was not reduced, looking at the considerable amount of money in hand, and the money that had been disbursed in instalments, the citizens were much better off. He was glad the gas supply was now in the hands of the Corporation. He should vote for the removal of the works, because he should be wronging the citizens if he did not do so.

Upon the question being put to the vote, the amendment was carried by 15 to 7, and it was then further resolved—"That the Gas Committee be authorized to decline the purchase of the land offered by the Railway Company, and take immediate steps to ascertain whether a site can be obtained for new works, and to report thereon."

#### DR. SIEMENS ON LIGHTING BY ELECTRICITY.

On Thursday, the 14th inst., Dr. C. W. SIEMENS, C.E., F.R.S., delivered a Lecture on "The Utilization of Heat and other Natural Forces," in the City Hall, Glasgow, under the auspices of the Glasgow Science Lectures Association.

The PRESIDENT of the Association (Sir W. Thompson, F.R.S.), who occupied the chair, in introducing the Lecturer, said: We live in an age of scientific wonders. A quarter of a century ago, chloroform, gun-cotton, nitro-glycerine, collodion, and photography formed a remarkable group of discoveries. Within the last three or four years we have had the radiometer, the telephone, and the phonograph in quick succession. Yet these do not exhaust the wonderful applications of science which we may see before us, and which are promised for the future. What would you think of Glasgow being lighted by the Falls of Clyde? coals consumed only at the pit mouth? all engines driven by machines innocuous of smoke? and the atmosphere of our towns restored to its primitive purity? What would you think of your public halls not over-heated by gas and the atmosphere spoiled by sulphurous emanations, but illuminated by the electric light giving 1-20th part of the heat and no fumes? What would you think of no steam power being used to drive the mills of Canada and the United States, but all the power being taken from the Falls of Niagara? If all these do not follow from the principles laid down this evening, it will not be from any want in them. After a few additional remarks in reference to the brilliant and inventive genius of the Lecturer, and his relations to the patent laws, in virtue of which he had become essentially an Englishman,

Dr. SIEMENS then proceeded with his discourse. It was extensively illustrated by some splendid diagrams, and by a number of striking experiments, involving the use of four powerful magneto-electric machines, three of which were laid down and driven by steam power in a large calendering establishment in the vicinity of the lecture hall. During a considerable portion of the lecture the hall was illuminated by two powerful electric lights, which excited a great degree of interest. The subject of the electric light, as produced by the dynamo-electric machines, formed a prominent feature in the lecture; and as this is, we believe, the first public deliverance of Dr. Siemens on the subject since the electric candle began to alarm Gas Companies, and to excite fond hopes in the minds of Gas Consumers, we now place his remarks on electric lighting before our readers. He said:

When, little more than a twelvemonth ago, I visited the great Falls of Niagara, I was particularly struck with the extraordinary amount of force which is lost, so far as the useful purposes of man are concerned. One hundred millions of tons of water fall there every hour from a vertical height of 150 feet, which represent an aggregate of 16,800,000-horse power, producing as their effect no other result than to raise the temperature of the water at the foot of the Fall—

$$\begin{array}{l} 150 \text{ ft.} \\ 772 \text{ ft. lbs.} \end{array} = 1\text{-}5\text{th deg. Fahr.}$$

In order to reproduce the power of 16,800,000 horses, or, in other words, to pump back the water from below to above the Fall, would require an annual expenditure of not less than 266 millions of tons of coal, calculated at an average consumption of 4 lbs. of coal per horse power per hour, which amount is equivalent to the total coal consumption of the world. In stating these facts in my Inaugural Address on assuming the presidency of the

Iron and Steel Institute, I ventured to express the opinion that in order to utilize natural forces of this description at distant towns and centres of industry the electric conductor might be resorted to. This view was at that time unsupported by experimental data, such as I have been able since then to collect, and before concluding this lecture I propose to bring some of the results of these further inquiries before your notice.

Our knowledge of electric force is, as you are aware, of very recent origin. The frictional electrical machine and galvanic battery have been utilized for producing slight effects at great distances, thus giving rise to one of the great institutions of the present age, the Electric Telegraph. We have hitherto failed, however, to produce, by means of electricity, effects in any way commensurate with those produced through the combustion and distillation of coal, which provide us with the means of driving our factories and lighting our towns with gas. It can be demonstrated, indeed, that the galvanic battery, which is dependent for its development of energy on the combustion of zinc, could never economically rival the effects due to the combustion of coal, for the simple reason that it takes 12 lbs. of coal to separate a pound of zinc from its ores, while the amount of energy liberated in the combustion or oxidation of a pound of zinc is represented by 1400 heat units, whereas that by the combustion of a pound of ordinary coal is represented by 12,000 similar units. The great discovery by Faraday of the induced current has enabled us, however, to produce electricity by the expenditure of force, and by a particular arrangement of a rotative armature and electro-magnets (which is chiefly due to my brother, Dr. Werner Siemens), the current so produced may be accumulated and directed in such a manner as to produce continuous currents, more powerful in their quantitative effects than could be accomplished by batteries or any other means. Very powerful currents indeed are produced by means of these machines, properly called dynamo-electric, by the expenditure of mechanical force only, in imparting rotative motion to an armature or keeper of cylindrical form surrounded by insulated wires, laid longitudinally upon the cylinder, and revolving with it in the magnetic field due to the polar surfaces of electro-magnets, the coils of which are excited by the very current set up through rotation in the wire on the armature.

Thus, an accumulative principle of action and reaction is inaugurated, not altogether dissimilar in principle to the accumulative action illustrated by the regenerative gas furnace; and as, in the gas furnace, temperatures can be produced, limited only by the point of dissociation of combustible matter, so the intensity of electrical action producible in the dynamo-electric machine is limited only by the point of ultimate magnetization of which iron is capable. As a matter of fact and experiment, a dynamo-electric machine, such as is actually employed at the Lizard Lighthouse, weighing altogether 3 cwts. 3 qrs., is capable of converting 3·3-horse power into electrical energy, which energy is employed for the production of an electric light equal to 4138-candle power. The smaller machine, which I have placed before you, weighs only 2 cwts. 2 qrs., converts 2-horse power into electrical energy, which energy may be employed for the production of an electric light equal to 1250 candles, or for producing mechanical force capable of being utilized at a distance for giving motion to machinery, for pumping water, or any other useful purpose. Experiments have shown that the amount of mechanical force that may thus be recovered is equal, or nearly equal, to one-half the force expended in the original production of the current.

Let us suppose that at some central station 100-horse power of steam or water power was employed to give motion to several dynamo-electric machines of the dimensions found most convenient in practice, and that, by means of metallic conductors of suitable dimensions, the electric current produced at the central station was conducted to a number of halls or factories requiring to be lighted, or to utilize mechanical power. If illumination were the only object in view, the total amount of light that could be thus produced would be equal to 125,000-candle power. This would be equivalent to 6250 Argand burners, each of 20-candle power, at a consumption per burner of 6 cubic feet of gas per hour, or a total consumption of 37,500 cubic feet of gas to produce the same effect of light. This would require 3½ tons of coal, and the electric light about as many hundred-weight.

It would be fallacious to suppose, however, that, in resorting to the electric light, we should be satisfied with anything like the candle power that now satisfies us in using gas, even as we are not now satisfied with the amount of light of lamps and candles since we have become accustomed to gas lighting. There is this further inconvenience connected with the electric light, that its rays are so intense that they must not reach our eyes without having first been softened down, either by the interposition of some semi-transparent substance, such as ground glass, or by directing the light against screens, or against the ceiling of the room, as was suggested by the Duke of Sutherland, so as to illuminate by reflection only. In making due allowance for these losses of effect, there remains, however, ample margin in favour of the electric light to make it cheaper, and certainly more brilliant, than gaslight. Its practical application for large halls, and places where powerful light-effects are required, will, therefore, be a question only of time, while, for domestic purposes, gas-light will long continue to hold its own, owing to the greater facility which it offers of subdividing the effects of light, and of accommodating its intensity to immediate requirements by simply opening and closing an ordinary tap. My present object, however, is not to discuss the relative merits of the two modes of illumination, but simply to show that power derived from a distant source is capable of being utilized for the production of light of a very brilliant character, a light which is comparable with solar light in showing every object in its true colour, and in producing similar chemical effects, such as the taking of photographic images.

If mechanical force is required to be distributed, the arrangements are, in every respect, similar to those for the distribution of electric light, and it has been proved, experimentally, that the amount of power recovered at the distant station is nearly equal to half the power employed at the central station. At first sight this loss of power may be considered large, but, if we compare the cost of producing a limited amount of power by the magneto-electric machine, and by a gas or steam engine, it will be found that the magneto-electric machine recommends itself, not only by its cleanliness, and by the steadiness with which it can be turned on and off at any moment, but that it is the cheaper machine as far as regards the consumption of coal. In working a small gas or steam engine, the consumption of fuel cannot be taken at less than 8 lbs. per horse power per hour, whereas in working a 100-horse power steam-engine on economic principles, 2 lbs., or say 2½ lbs., per hour of coal suffice to produce one horse power. Suppose that 45 per cent. of the power available at the central station is reproduced at the distant one, the amount of coal per hour consumed at the distant station would be

$$2\frac{1}{2} \times \frac{100}{45} = \frac{250}{45} = 5\frac{2}{3} \text{ lbs.,}$$

or 30 per cent. less than if a gas or steam engine were directly employed. The principal objection that has been raised by electricians to the conveyance of power to distances of miles, as here proposed, is on account of the apparently rapid increase in the size of the conductor required with increase of distance. In order that the magneto-electric machine may



work under the most favourable conditions, it should have an internal resistance, depending in a great measure upon the nature of the work to be performed, but not exceeding for quantitative effects the one ohm or unit of resistance. If the resistance is greater, a notable proportion of the power expended will be converted into heat in the conductors, causing both loss of effect and great inconvenience. By another law, the electrical existence of the circuit exterior to the machine should be somewhat, but not much, larger than the internal resistance—say,  $1\frac{1}{2}$  units. The external resistance is composed of two elements—viz., the conductor and the resistance of the electric lamp, or electro-magnetic machine, which latter may be taken as amounting also to one unit, leaving only half a unit available for the conductor. These conditions determine really the size of the conductor for any distance to which the current has to be conveyed. Suppose the distance to be half a mile, a copper wire of 0.23 inch diameter will produce the half unit resistance to be desired, which is already a wire of considerable thickness, for the purpose of working a single lamp. If the distance be doubled, wire of the same resistance would give twice the electrical resistance; and in order to reduce it again to half a unit its sectional area must be doubled. We have thus a conductor of double length and sectional area, and therefore of four times the weight; and, relying upon this calculation, it is argued that the weight of the conductor must increase as the square of the distance, so that a conductor of 30 miles length would require to be  $60^2 = 3600$  times the weight of the half mile conductor, and this enormous increase of weight would certainly be required if the object to be accomplished were the working of one electric lamp by a dynamo-electric machine.

My critics have, however, fallen into the error of overlooking the fact that half a unit resistance is the same for a circuit capable of working one lamp as it is for working a hundred or a thousand lamps. Electricity is not conducted upon the conditions appertaining to a pipe conveying a ponderable fluid, the resistance of which increases with the square of the velocity of flow; it is, on the contrary, a matter of indifference what amount of energy is transmitted through an electric conductor, the only limit is imposed by the fact that, in transmitting electrical energy, the conductor itself retains a certain amount proportional to that transmitted, which makes its appearance therein in the form of heat. If this heat were allowed to accumulate, the electrical resistance of the conductor would increase in proportion to such increase, and a point might be reached where fusion of the wire would ensue. [This fact was illustrated by a thick platinum wire stretched for a length of about 18 feet across the platform, and connected with the magneto-electric machine, becoming raised to an intense white heat. The lecturer proceeded.]

The real power of transmission of an electric current depends, therefore, upon its capability to discharge its heat to surrounding objects, and it will be readily conceived that a wire of 60 times the sectional area, and 60 times the length of another wire, is capable of radiating away

$$60 \sqrt{60} = 460$$

times as much heat per hour as the smaller conductor, and that 460 machines or lights may be supplied through it without causing inconvenience. When, some week ago, I had occasion to use this argument before the Institution of Civil Engineers, your President, who happened to be at the meeting, immediately recognized its force, and with the fertility of mind for which he is so remarkable, there and then suggested a means by which the transmitting power of a large electrical conductor might be almost indefinitely increased by giving it the form of a hollow tube through which water might be made to flow. It is evident that cold water flowing through such a conductor would prevent an inconvenient accumulation of heat in the metal, and in would not be difficult to introduce and discharge the flowing water at intervals from the pipe without interfering with the necessary insulation of the conductor from the earth.

After this digression, let us return for a moment to my proposal of last year to convey 1000-horse power a distance of 30 miles through a conductor 8 inches diameter. The electrical resistance of this conductor would be 0.18 of a unit; and, supposing that the total resistance in circuit was made  $2\frac{1}{2}$  units, which, as I have before stated, gives a favourable

working condition, it follows that  $\frac{0.18}{2.5} \times 1000 = 72$ -horse power would be expended in heating the conductor. This would represent about 15 lbs. of coal per hour—a quantity quite insufficient to raise a mass of 1900 tons of copper, with a surface of 132,000 square feet, to a sensibly heated condition. So far from admitting, therefore, that I have overstated my case regarding the capability of my large electrical conductor, I am convinced, on the contrary, that its sectional area might safely be reduced to one-half that previously given, or its diameter to 2 inches, whereby its cost would also be reduced one-half.

It would not be necessary to seek on the other side of the Atlantic for an application of this mode of transmitting the natural force of falling water, as there is perhaps no country where this force abounds to a greater extent than on the West Coast of Scotland, with its elevated lands and heavy rainfalls. You have already conducted the water of one of your high-level lochs to Glasgow by means of a gigantic tube, and how much easier would it be to pass the water in its descent from elevated lands through turbines, and to transmit the vast amount of force that might thus be collected by means of stout mechanical conductors to towns and villages for the supply of light and mechanical power.

#### AUTOMATIC GAS LIGHTING.

At the Ordinary Meeting of the Society of Arts, held on Wednesday, March 6—Professor JOHN TYNDALL, LL.D., D.C.L., F.R.S., &c., in the chair—the following paper on the above subject was read by Mr. ST. GEORGE LANE FOX, whose invention was described and illustrated in the JOURNAL of Jan. 1, page 18:—

Arranged along the walls of this theatre there are several gas-burners connected with the gas-mains, and controlled by an electrical apparatus I have on the table. I would ask you to imagine that each one of these lights or burners represents a street lamp, removed from me at a considerable distance, and some 30 or 40 yards apart. Now, it is evident that, if the double operation of lighting and extinguishing these lamps is to be performed by me, I should have to go to each separate lamp twice so as physically to operate on them, or else I must have some means of action at a distance; and this latter process is commonly spoken of as automatic gas lighting. Now, looking over the various forms of action at a distance at our disposal, it will be seen that light, heat, and sound must be set aside as inapplicable to the purpose; there remains, therefore, mechanical action, either direct or otherwise, and electricity.

When the matter was first taken up some years ago, and it was known that an electric spark or a fine platinum wire, rendered incandescent by the electric current, would ignite a stream of gas, it was naturally thought that there would be no difficulty in applying this agent to the lighting of street-lamps, and many large buildings were fitted up with appliances by which a current of high tension electricity was conveyed to the burners by means of insulated wires.

The sunlight in this theatre, for example, is lit by this system, and the Albert Hall, the Assembly Rooms in Paris, and various other places

are similarly treated; in all these cases the gas is turned on and off at the main. This system is extremely convenient, as sometimes in very large halls the lights are so placed as to be almost inaccessible for the ordinary process of lighting. When, however, it was attempted to convey this high tension current to any great distance, the greatest difficulty arose as to the insulation of the wires; moreover, this method would be only available for producing one, or at the most two or three sparks in a single circuit, and the idea was therefore abandoned. It was also found out that to produce any large number of incandescent platinum wires in circuits of great length, and accordingly high resistance, was also impracticable. In these two systems there are of course no means provided for turning the gas on and off, which is an absolute necessity for any automatic system to be rendered useful. Accordingly, the idea of lighting street-lamps by electricity was, for the time, put aside.

We now come to mechanical action. It has occurred to a great many people that, by increasing or diminishing the pressure of the gas in the mains, it would be possible to actuate an apparatus in each lamp so as to turn on the gas and shut it off, and, by having a small jet burning all day by the side of the principal burner, the issuing gas would be ignited. But, in combination with this pneumatic action, various other methods suggested themselves for producing ignition—such, for instance, as setting up an electric current by raising the level of a liquid so as to bring it in connection with opposing metallic surfaces, thereby forming a galvanic couple; and, in some instances, the heat produced by chemical action has been made use of. After very numerous trials in this direction, I think I may safely say this system has also been abandoned, not only because the alteration of pressure would be a source of serious inconvenience, and even danger, to the consumers, but also because the construction of the gas-mains does not admit of any material increase in the pressure at a distance from the works. A scheme has been proposed in which pipes are laid down to all the lamps, so that, by increasing the pressure and exhausting, a double action can be obtained, so as to turn on and extinguish the gas, but by this means a separate electric system has to be employed for producing the flame.

I will not trouble you further with details of these several inventions, but will proceed at once to explain the method by which I propose to apply and utilise electricity alone as the agent for lighting and extinguishing gas. In the first place, then, I supply every lamp with an apparatus, such as you see it there; next, the lamps must be connected with an insulated conductor, so that, starting from a central station, a wire would travel through each of these machines and back again to the station. I propose that several of these circuits, each connecting and controlling 200 or 300 lamps, should proceed or radiate from a central station, so that from one point several thousand lamps could be operated upon almost instantaneously.

The method by which I have succeeded in producing the ignition of the gas at a considerable distance, and at numerous points, is by supplying each lamp with a small induction coil, so that the primary wires of each one of these induction coils form part of the circuit, so, in fact, as to preserve without a break the metallic continuity of the line. When first the idea suggested itself to me, I connected together two or three of these coils with a battery of six large bichromate cells, and placed in the circuit a private telegraph line of about three miles in length. I joined up the circuit by an ordinary vibrating contact breaker and condenser of tinfoil and paraffined paper, similar to that used in the Ruhmkorff coil. On setting the battery in action, and making and breaking contact, I was unable to obtain the faintest indication of a secondary discharge. I accordingly used a very much more powerful battery, composed of 55 very large Bunsen cells. With this enormously powerful current I was just able to feel a small shock from the secondary wires, but could not obtain sufficient spark for ignition of the gas. Accordingly, I considered that this method was not practicable, when it occurred to me that in reality the amount of work to be done, in producing a number of these small electric sparks, was extremely minute, although at the same time requiring to be produced almost instantaneously. Now, the amount of work which an electric battery will produce is dependent on the time during which action continues; and in a single instant, or say the thousandth part of a second, the actual amount of power available is naturally extremely small, and I thought that if I could by any means accumulate this power for a short time, and then bring it suddenly to bear upon the circuit, the desired result would be obtained. As an illustration of what I mean, supposing I was desirous of breaking some extremely hard substance, such as corundum, and I had at my disposal nothing but a very small hammer, it would be quite possible that I should bring an indefinite number of strokes to bear upon this substance without producing any result, while, by accumulating all the energy expended in these blows into one tremendous thump I could reduce this hard substance to fragments. I have here upon the table the apparatus by which I have succeeded in accumulating the electric current and storing it up into this condenser or electric reservoir, composed of glass plates and tinfoil laid side by side alternately.

The condenser, however, is not charged direct by the battery, but the current is made to work this Ruhmkorff induction coil, from which there is derived a current having an enormously increased electro-motive force, and it is this electricity that is stored up in the condenser.

Having charged the condenser in this fashion, the whole of the electricity is at once sent through the line, and produces, as I have said, most extraordinary results. So much, then, for the lighting of the gas. The process of turning on and off the gas, although involving many important details, is very simple. I make use of the soft iron core which runs through the centre of the coil to produce a reciprocating horizontal motion of a permanent horse-shoe magnet, suspended on needle-points just above the coil. The soft iron core with the primary coil is, in fact, an electro-magnet, which can be magnetized so as to render its poles reversible at pleasure; the magnets are carried in a small metal frame, having a passage through it for the gas to pass to the burner at the top, and being provided with a stopcock, or valve, which is actuated by the reciprocating magnet. The whole of this apparatus is enclosed in an airtight metallic case, which measures about  $2\frac{1}{2}$  inches high by 2½ wide, and is screwed on to the supply pipe in the lamp; the insulated conductor or line wire being carried down the interior of the lamp-post and laid under ground, except, of course, where an overhead line is admissible. The turning of the gas on and off is accomplished by opening and closing what may be termed an electric needle-tap. The plug of this needle-tap is cylindrical, and about a quarter of an inch in diameter, and is carried in a socket, which it fits rather loosely. It is made to turn in this socket by the action of the reciprocating magnet, a couple of studs on which are brought into contact with a small pin or lever connected with the plug, and forming, in fact, the handle of the stop-cock. The annular space between the plug and the socket (which is about one-thousandth part of an inch) is filled with some liquid, which is retained by capillary attraction between the two surfaces, the joint being thus rendered perfectly gas-tight. The oil of bitter almonds and glycerine are both well adapted for the purpose, on account of their non-oxidizable character, and from the power they possess of resisting the action of very low temperatures. It will be seen that a special feature in the apparatus



is the introduction of a fixed core, which can be magnetized so as to render its poles reversible at pleasure, and in conjunction with it a moveable magnet, the polarity of which is permanent. An electric current sent either forwards or backwards for a few seconds, will turn the gas on or off in every lamp in the circuit, according to the direction of the current.

I have been experimenting for a long time on the subject, and, although I have met with considerable difficulties, I think I am now in a position to state that there is no reason why the system should not be applicable to the lighting of the lamps in any large town. By the kindness of the Directors of The Gaslight and Coke Company, I have been able to test the practical working of the scheme on a somewhat extensive scale, and several lamps have now been in operation for about a year.

I should now like to make a few remarks on the way in which I propose to put the system into practical operation. As I said, there would be for any district of say 2000 or 3000 lamps a central station, from which the wires would proceed in every direction, so as to command a number of distinct circuits. All that is necessary to have at the central station would be a battery of some sort, or, what I would very much prefer, a magneto-inductor—that is, a machine for producing an electric current by mechanical means. As no solutions are used for generating the current, there will be none to replace, and it is always ready for use, so that by turning a handle a powerful current is produced. I believe that these machines have been adopted very largely on the German railways, for releasing clockwork used in signalling, or wherever a rather powerful current is required for a very short length of time. When I say powerful, I mean as compared with the ordinary telegraph currents, which are sometimes not more than the thousandth part of a vebel. By means of a switch and a commutator, the electric current from this machine can be directed so as to operate separately on each one of the circuits, and by these means turn the gas on or off. Let us suppose the gas turned on, the next process is, of course, to light it. This is effected, as I have said, by sending a discharge from the condenser. A condenser such as I have here would, I believe, have a sufficient capacity for lighting about a hundred lamps. It is extremely simple in construction. It is constructed of alternate metallic plates, with an insulator or dielectric between them; the conducting surfaces in this case are of tinfoil, and the dielectric of crown glass. A number of plates are used, so as to get a large surface in a small space. The simplest form of condenser is that known as the detonating plane, and consists simply of two sheets of tinfoil pasted on opposite sides of a glass pipe. The coil used for charging the condenser need not give more than about three-quarters of an inch spark in the air. The discharge, like the current, will, of course, have to be sent through each circuit separately, and this is also done by means of the switch arrangement. The chief objection that has been raised to any system of lighting street lamps by electricity is that the conducting wires would be liable to be cut, and so interrupt the continuity of the line. But I am sure that this is only an imaginary difficulty, as it would be a very simple matter to discover the place of rupture and patch it up temporarily, almost as quickly as it would take to light a single lamp by the present process. For instance, a double earth could be made at the point of rupture, so as to divide the circuit into two; besides which it is extremely improbable that more than one circuit would be out of order at the same moment, and just at the time of lighting or extinguishing. I have here a sample of an underground cable, specially prepared for me by Messrs. Siemens Brothers. It consists of a core of one solid copper wire, insulated with two layers of gutta-percha, served with tarred jute, and sheathed with 14 BB. galvanized iron wires, then served with one layer of tarred jute yarn and two coatings of compound. The diameter of this cable is about half an inch. It will, of course, be laid in the ground without any additional protection, being in itself very strong and durable. Cables very similar to this one in construction have been very extensively laid in Germany for the underground telegraph lines. I am, however, of opinion that an overhead line, well out of reach—that is to say, about 16 feet from the ground, and supported as they are now in Pall Mall, would answer well for any small districts where it would be thought too expensive to lay an underground cable.

In the subsequent discussion on the paper, Mr. DIBLEY said that, having taken some interest in the lighting of the district in which he lived, he was under the impression that Mr. Fox would have given some information relative to the cost of this system, and what saving would be effected by it, because that was really the vital point in the matter. He understood the proposal was to light the gas in the manner shown by a suspended wire, or by a cable laid under the streets; but the carrying on of an experiment at the Fulham Gas-Works would be very different to doing it in a public highway, where he feared there would be an opportunity offered to boys and mischievous persons to play practical jokes if the wires were placed overhead. Again, at the present time, when rates were so high, vestries would be very indisposed to entertain any new scheme, unless they could see that it would be the means of saving money. He hoped, therefore, the lecturer would state the cost of laying cables—which he believed was the only practical method of carrying out the plan—and also the cost of maintenance for lighting 10,000 lamps. Also what supervision would be required, and if it was likely that the Gas Companies would be induced, by the adoption of this system, to decrease the price at present paid for gas per lamp. An experiment might be very successful, but unless it was likely to be economical there would be no chance of its success.

Mr. F. J. BRAMWELL said they had just heard one of those conservative and economical speeches which were the bane of every inventor in England. Mr. Fox had come before the Society of Arts with one of the most ingenious inventions he had ever met with, having tried it on a considerable scale for a year, and now desiring to try it in public; and, instead of receiving the encouragement he deserved, he was met with the objection that, unless he could say at the outset what was to be saved by it, he was not to be listened to. Gas lighting had originated in England, but it was left for the Continentals to show us that, though it required a man to go up a ladder to light an oil-lamp in England (for, on the Continent, the lamp was lowered), a gas-lamp might be lit by a light on the top of a pole, and that plan had been adopted for 12 years in Paris before it was followed in London. He had not the slightest doubt that, if this invention were taken up—as he hoped it would be—and worked for a year, it would then receive the support of the London Vestries. Passing from that point, he desired to say a few words in commendation of this most excellent invention. What was the problem Mr. Fox had set himself? First, how to turn the gas on; having got it turned on, how to light it; and, lastly, having got it lighted, how to put it out. These were not very easy things to do from a distance. Dealing with a large number of lamps, he said that the enormous power required seemed to beat him, but that when he thought of it he found that the requirement was enormous only for a short time, and that if, therefore, he could utilize for a period a small power and store it up, as a man stored up his small income till quarter-day, so that then, without having a large income, he could pay his rent when it was due, this difficulty would be got over. Then, as to turning the gas on and off, he had shown a most ingenious method, by which he had the means

of producing a reverse motion in the permanent magnet which turned it on, and having done so he was not compelled to keep the power on during the whole time the gas was burning, as if it had to counteract a spring which would turn it off, but could, by one action, turn it on and leave it burning until he was pleased to reverse the current to turn it off. Then there was the difficulty of the gas-taps, in which—made as well as they could be—there was always considerable friction. He appeared to have directed his attention to this in a most ingenious way. He did not attempt to get power enough to turn on a tap with ever so small a friction, but used a weighted lever to perform a rapid rotation, and when it had performed a considerable rotation, and got a momentum, and was at the point of greatest attraction, then it acted on the tap, when it would be able to overcome the small friction which there was, and which besides was reduced to a minimum by using glycerine or oil of almonds, which would not become sticky or evaporate, but would bear a pressure of 8-10ths of an inch, though the real pressure was probably not more than 2-10ths after the governor was interposed between the pipe and the burner. This showed how one invention grew out of another, for he did not think it would have been possible to use this invention if gas-lamps were not fitted with governors, because there would be the difficulty of suiting the taps to the various pressures; but as lamps were now fitted with governors they were rendered independent of the pressure in the main, provided only there was pressure enough, and the taps could be turned fully on, so that every lamp would burn with a proper size of flame and no more. Having in this way turned on the tap and lighted it, by a reverse current he turned it off again. But, having devised all this, it was rather hard that Mr. Fox should be met with the discouragement that unless he could say what would be the saving when it was thoroughly perfected, they did not care to listen to him.

Mr. HALE said he did not consider that Mr. Dibley made his remarks in any carping spirit. Something of this kind was experimented upon 30 or 40 years ago. Mr. Fox could perhaps show that the very fact of being able to instantly light and put out the gas would result in a very large saving. It appeared to him that the difficulty would be to light lamps three or four miles from the gasholder, and if this could be accomplished, no doubt the invention would be successful.

Mr. BENNETT, as a member of a Vestry, would like to know how many lamps could be lighted by one battery. In his parish the lamps were placed 50 yards apart, and there were 3300 of them. It would be a great saving and a great convenience to the public if the proposed system could be carried out. They were now paying 18s. per lamp per annum for lighting, cleaning, and painting. If this method could be adopted, they could on the average save one hour's gas, or 1-12th of the whole, and as they paid about £16,000 a year for gas, that would be a considerable amount. They paid, with extras, £4 5s., £4 7s. 6d., £4 12s. 6d., and £4 14s. 6d. per lamp, because they had four Companies in their district, and each had a different price and system. By this method of lighting there would be a large saving every year, and the public would be better pleased, because it was evident that in such a system they would have an equal flame in every lamp, and he was quite sure that if this condition could be fulfilled the invention would be supported.

Mr. CHADWICK, M.P., having been connected for 20 or 30 years with the lighting of a large corporate town, had had considerable experience in the matter; he had also had an opportunity of seeing the experiments at the Fulham Gas-Works, which were very satisfactory. Although he agreed with what Mr. Bramwell had said, he could not help coming back to the point that, after all, the value of an invention lay in its practical application and in its economy. They might pass a unanimous vote of thanks to Mr. Fox for his perseverance and ingenuity, even though the invention were not an economy, and no one would refuse to join in giving so young a man encouragement, so that he might go on to further and greater achievements. Taking up the question put by the first speaker, the test after all was this—whether the invention would not only benefit the general public, but prove a saving to the pockets of the ratepayers. He had made a calculation on the figures given by Mr. Bennett, and would give the results. It appeared that in his parish they paid from £3 to £3 10s. per lamp. The time would come, he hoped, when they would have united management and united gas-works, and when the public would be the possessors of the gas and water supply, but it was not so yet. They had then to demonstrate to the Gas Companies that by the application of this invention they could, under their present contract, light the gas and turn it off at fixed times, and by so doing effect a saving. He should say that at least one hour per day could be saved on each gas-lamp in the Metropolis. What did that mean? Taking it at 1-12th of the whole, it amounted to 5s. per lamp. But then there was the expense of lighting. He had sometimes been awakened in the middle of the night, when the moon was shining brightly, to know if the gas-lamps might be turned off, and at other times, when the moon did not shine when it ought to, the gas wanted lighting unexpectedly. Now, it cost about 14s. per lamp for this attention, so that altogether there was a saving of nearly £1 per lamp. The next question was, what would it cost to effect that saving? As far as he knew, the system was comparatively inexpensive, and he believed it could be applied and maintained for something like 30s. per lamp. If so, what would it cost the parish? They could borrow the money at 4 per cent., and he believed a contract could be made by which at least one-half of the £1 per lamp would be saved. If this could be done in every large parish in England, the total saving would be enormous. He believed Mr. Fox was willing to place himself in the hands of any one who would take up the invention, and he was glad to know that there was going to be a public exhibition of it in Pall Mall, where he would publicly light and extinguish the whole of the lamps as often as the authorities might require.

Mr. STRODE asked whether during the time the lamps were in operation at the Fulham Gas-Works, the tap or valve which turned on the gas was ever found to stick. That appeared to him to be the weak point, and he should like to know what amount of force could be exerted on the lever if it did stick. He thought the continued action of the gas on the oil must tend to thicken it. He saw no other difficulty, and the saving in cost must be enormous.

Mr. PRICE thought if this invention were carried out throughout London, and as they had heard, mischievous boys, by tampering with the wires, might prevent the lighting of the gas. This would be very serious, because the whole Metropolis might be left in darkness, and to guard against it it would be necessary to keep a large staff of men ready to light the lamps in the ordinary way.

Mr. CHADWICK said it was not intended practically to carry the wires overhead, where they would be exposed to danger, but underground.

Mr. PERRY F. NURSEY said he had an opportunity of inspecting the working of this invention at Fulham at the close of last year. He went with the intention to find fault with it if he could, but the result of his observations was entirely satisfactory. Not content with that, he made many inquiries of Mr. M'Minn, the Company's Engineer, who assured him that he had watched it most carefully, and had no fault to find with it. His attention was particularly directed to the point just raised about the sticking of the valves, but these he found had given no trouble at all.



Mr. PREECE thought he could at once dispose of the objections raised with regard to the difficulty of maintaining the wires in working order, and the probability of their being destroyed by naughty little boys or other mischievous persons. At the present moment there were in the streets of London 5000 miles of wire, which were carrying the thoughts and wishes of the people to all parts of the world, and the notion of any wire ever being disturbed had never entered the head of any practical telegraphist. More than that, he had just returned from visiting a country where there were as many wires overhead as there were in London underground; for, throughout the United States, in all the principal towns the telegraph wires were carried through the streets, and no one ever dreamed of the wires being damaged. More than that, there was a town called Providence, where the whole of the street lamps were lit by electricity, and the wires were carried overhead. It was there where the gas was turned on and off, as Mr. Fox had described, by pneumatic pressure, electricity being used only to light it. He had not time to go and see it, but he made several inquiries, and he found that opinion was very much in favour of the system as being economical. As to the practical difficulties, when it was considered that every morning in this country cannon were fired in Newcastle, Edinburgh, Swansea, and other places; when time-balls were dropped here, there, and everywhere; and when the Greenwich current was distributed over some 100,000 miles of wire, he did not think any telegraphist would feel the least alarm when asked to devise a system of lighting a few thousand lamps in London.

Mr. W. KING, as the Engineer to the largest provincial Gas Company in the kingdom, said the subject was a very interesting one to him. He trusted that in any remarks he might make with regard to economy, he would not be considered as in any way reflecting on the skill and ingenuity of the inventor. He should greatly lament if that institution were the means of checking instead of advancing inventions, but still, as had been said, the value of every invention depended on the way in which it could be practically applied. He might also say, in reply to a remark made by Mr. Bramwell, that the town of Liverpool might claim the priority over Paris of using a pole for lighting street lamps. With regard to the lighting of lamps by electricity, the case would, of course, be ultimately considered, and there were two points to which he should have to direct Mr. Fox's attention. One was the cleansing and repairing of lamps, which would necessitate the employment of a considerable staff; and, secondly, the employment of a staff to meet contingencies which would arise from time to time.

The CHAIRMAN said he remembered, some years ago, Mr. Fox coming to him with a certain scheme, which, at that time, he considered an ideal one. He had certain notions in his head, which he put forward with a great deal of ardour. He could see there were many difficulties in his way, and he could only say to him: "My dear friend, you will have to work it out." He did not expect then to hear that night so practical a response to his recommendation, for it would be agreed by all present that, as far as the application of scientific principles and considerable mechanical skill were concerned, he had really given a very satisfactory practical answer to his recommendation. He had, of course, followed this matter as a man of science, and he had been much pleased at the clearness and soundness of the views enunciated by Mr. Fox. His employment of scientific means was perfectly judicious, and, as far as he could see, he was perfect master of the agent he was operating with. He did not think he had any reason to leave the room with the idea that the meeting had not been disposed to give every encouragement to him, for there had been no remarks made which could be construed as anything like a feeling of carping criticism. Even the gentleman who first spoke evidently did so most good-naturedly, and his views certainly had their value. It gave him great pleasure to notice the evident desire there was to encourage a young inventor, which had been evinced by the meeting. It must have been very satisfactory to Mr. Fox to hear the observations of the honourable member for Macclesfield, and those of other speakers, especially those of so able a man in practical matters as Mr. Preece. All that he had to say was that Mr. Fox had every reason to quit the room with his courage strengthened, and with a determination to proceed to a successful issue. And he trusted that as he proceeded farther and farther, he would make it more clear to the community at large that he had really struck upon a useful invention, and that by-and-by the scientific application would be justified by the economic results.

Mr. Fox, in reply, said that almost every objection raised had been answered by some kind friend. A question had been raised as to the working of a large number of lamps at a distance from the works, and he might mention that he had been able to light a large number of lamps included in a circuit having a resistance of about 300 ohms, which would represent 30 miles of ordinary telegraph wire.

The CHAIRMAN having proposed a vote of thanks to Mr. Fox, Sir ANTONIO BRADY, in seconding the motion, said that, as President of the Inventors Institute, he had listened with intense interest to the paper and discussion, and he was all the more interested for being a Director of a large Gas Company. They had immense losses by reason of the imperfect way in which they had to light and put out the lamps, far more than had been assumed that night; and he was much pleased to hear that the mechanical contrivance had been so much improved since he last heard of the invention. On reading the patent, he found there were several grave objections, which now seemed to have been removed. With regard to the cutting of the wires, he did not know that it was proposed to light the whole of London by one machine, but only a certain number of lights in one district; and he could see no possible objection to that. As an old member of the Society, he should have been exceedingly sorry to hear any discouragement offered to a young inventor, and should have protested against it had it occurred.

The resolution was carried unanimously.

#### NEW COMPOUNDS FROM COAL GAS.

By Mr. LEWIS THOMPSON.

Although the substances here referred to have been obtained from purified coal gas, it must not be understood that the author of these discoveries has any more serious belief in the mischievous results said to arise from sulphur in gas than he has in the witches of Hopkins or the Popish Plot of Dr. Titus Oates; on the contrary, he is not without a hope that, by the progress of real knowledge, the existing disgraceful enactments regarding coal gas will be sent to keep company with the two comparative illustrations above alluded to, and, for the sake of science, the sooner this happens the better.

It has been proved that the bisulphuret of carbon, like cyanogen, possesses a power of uniting directly with metals without the intervention of oxygen or any similar body, and hence it has received in that form a distinguishing name, "Erythrogen."

Guided by this property, an attempt was made to discover whether erythrogen could displace cyanogen from any of its combinations, and in making this attempt, it was not only discovered that cyanogen can be so displaced, but also that in so doing two hitherto unknown compounds are produced, both of which possess very remarkable qualities. The first experiment was made upon a sample of coal gas known to contain a rather

large proportion of bisulphuret of carbon, and it was conducted thus: A set of Liebig bulbs were charged with a solution of caustic potash, in which a quantity of bichloride of mercury had been previously dissolved, and the coal gas in question was then slowly passed through the bulbs with the following results:—In a very few minutes the solution became milky, and this continued to increase for several days, with the deposition of a white precipitate, which, however, by a continuance of the experiment, became first grey, then black, and at last of a beautiful scarlet colour, thus proving the existence of at least two, perhaps three, different compounds. It required a great many experiments to discover the nature of these compounds, and also a sure and certain method of making them uncombined with each other; but at length all difficulties were overcome, and the following process adopted:—Having ascertained by analysis that the scarlet compound derived nothing from the coal gas but the bisulphuret of carbon contained in it, the gas was abandoned, and pure bisulphuret of carbon employed in its stead in this manner. A strong solution of the cyanide of potassium is to be boiled for several minutes upon biniodide of mercury, or, what answers equally well, the nitric oxide of mercury, sold by apothecaries; it is then to be mixed with three times its bulk of a very strong solution of caustic potash, and when it has become cold it must be cautiously decanted into a Florence flask or other convenient vessel, and a considerable quantity of bisulphuret of carbon added to it with frequent agitation. The mixture assumes in rapid succession a variety of tints, passing from white, yellow, brown, and grey, into black, and if then left to the ordinary temperature of the atmosphere, the black is changed into scarlet in the course of 24 to 48 hours, according to the quantity of caustic potash present; the larger the amount of potash, the shorter is the time required for the development of the scarlet colour. But this change is soon brought about by the employment of heat, and, therefore, the flask containing the mixture should be placed in a water-bath having the temperature of about 110° Fahr., when in about half an hour the scarlet precipitate will have formed in the flask, and we may distil off and collect the surplus bisulphuret of carbon, after which the pigment must be well washed with hot water and carefully dried. As thus obtained, ponselion is a scarlet powder of a very brilliant tint, which differs from that of vermilion so slightly that the two substances are very liable to be confounded with each other, but may easily be distinguished by subliming a little of the powder in a small glass tube, when vermilion will retain its red colour, but ponselion sublimes and forms a jet-black mass, frequently containing numerous metallic spangles that strongly resemble metallic antimony and tellurium, although it becomes red when finely powdered. The tint of ponselion is, however, not so purple as that of vermilion; and a very eminent portrait painter has pronounced it "the nearest approach to the natural hue of the European countenance" that he has ever met with. We may, therefore, conclude that it will come into general use as a pigment, and hence its qualities become an interesting subject of inquiry; and it is satisfactory to find that ponselion rivals gold itself in respect to resisting the effect of atmospheric influences, for it is unacted on by any one of the concentrated acids, even when boiling hot; and it is only attacked, like gold, by *aqua regia* and those fluids which generate chlorine. It is, moreover, unaffected by sulphuretted hydrogen, or any of the hydrosulphurets, and, as a paint, may fairly be said to be imperishable. Its composition appears to be very peculiar, though a sufficient number of analyses has not yet been made to settle that question beyond the range of doubt. Nevertheless, it seems to consist of one atom of mercury (202), three atoms of sulphur (48), one atom of carbon (6), and one atom of hydrogen (1), thus making 257 as its atomic equivalent, and leading us to conclude that it is a hydro-erythride of the protosulphuret of mercury, from whence we may infer that it might be made by a very different process to that above described, and, indeed, we may naturally expect many improvements in the mode of its production.

For example, if we regard ponselion as a hydro-erythride of the protosulphuret of mercury, we might expect to form it by merely precipitating a mixed solution of the erythride and sulphuret of potassium by a solution of the protinitrate of mercury; but this experiment has not yet been tried, although, if successful, it would be a very economical mode of making the pigment.

We have seen that the first effect produced by passing coal gas through an alkaline solution of the bichloride of mercury is to create a white precipitate, and if we arrest the process at that point we obtain, in the usual way of washing and drying, a grey-white powder, which, on the application of heat, explodes with much violence, and requires, therefore, to be examined with care. It has not yet been analyzed, and in all probability consists of two distinct substances—one containing sulphur, and the other cyanogen united to some form of hydrocarbon; it is to this last that the name "cyanon" has been provisionally given. As procured in the way described, cyanon is a white powder having a greenish-grey tint, and when a few grains of it are heated in a test-tube, it explodes at a heat of about 400° Fahr., with much force, and the production of a considerable quantity of soot or carbon, whilst the mercury is thrown out of the tube to a considerable distance, so that cyanon may truly be said to combine the qualities of both gunpowder and shot. The cyanogen compound, which in cyanon is united to mercury, has been transferred to copper with the production of a copper salt having an explosive quality quite equal to the mercurial compound, and in all likelihood this copper salt is the substance which has frequently caused explosions during the repairing of old gas-meters by soldering them. This explosive quality is, however, destroyed by the action of hydrosulphate of ammonia, and no doubt common gas liquor would answer the same end, so that it would be a wise precaution to bathe old gas-meters in gas liquor before attempting to apply a heated soldering iron to them.

To obtain cyanon, it is not necessary that there should be an excess of caustic alkali present in the liquor, for this is needed only to ensure the formation of ponselion; consequently, we have merely to boil a solution of the cyanide of potassium upon an excess of peroxide of mercury, and, after filtering the cold liquor, pass a current of purified coal gas through it until a sufficient quantity of white precipitate has been formed, which must then be washed and dried in the usual way.

During the above process, as well as in that by which ponselion is produced, there are formed acids of an unknown kind, part of which remain in the liquor combined with the potash; and it was my intention to carry out the investigation of these things to their complete elucidation, but a domestic calamity has so shaken my health that this is now impossible, and, therefore, I leave the subject unfinished.

A few words, perhaps, require to be said in explanation of the term "ponselion." It is derived from the ancient Roman name of Newcastle-upon-Tyne, which was Pons Ælii; and as the substance itself was first obtained out of gas made from Newcastle coals, the name can scarcely be objected to as a mere mark of distinction from vermilion, for which purpose alone it is intended.

WATER SUPPLY IN THE UNITED STATES.—Chicago uses 52 million gallons of water daily, or 120 gallons to each inhabitant. The average waste, which in 1858 was 33 gallons daily per head, had increased to 92 gallons in 1876, and some means are needed to avoid this enormous loss.



# THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is still only a very limited amount of business doing in this district, the demand for both coal and iron being very small, with prices low and irregular, owing to stocks being pushed on the market by needy holders who are compelled to realize.

All classes of round coal now move off very slowly, and prices are a trifle easier. The Manchester Corporation, who, during the high prices ruling a couple of years back, were in a very favourable position with regard to their contracts for gas coal, are evidently considering the advisability of again securing forward supplies at low prices, and I understand that numerous tests are now being made with various descriptions of coal, with the view of entering into contracts for long forward deliveries. Prices have certainly now reached a very low point, and although, perhaps, during the summer there may be a little further giving way, this can scarcely be to any very material extent, as there seems to be a strong feeling amongst the leading colliery proprietors to run short time, or even stop some of the pits altogether, rather than throw coal upon the market at much lower prices than they are now compelled to accept, and it is questionable whether prices are not already quite as low as would be taken for any long-running contract. Inferior classes of fuel for iron-making and steam purposes are still a drug in the market, and it is only in slack, of which there is less now being made, and for which some inquiries are coming to hand for brick-making, that there is any prospect of improvement. For sales in bulk, prices at the pit mouth may be given at about 8s. to 9s. for ordinary good Arley, 7s. 6d. to 8s. for Pemberton four-feet, 5s. 6d. to 6s. 6d. for common coal, 4s. 6d. to 5s. 3d. for burgy, and 2s. 6d. to 3s. 6d. for ordinary slack.

The coke trade is very dull, and low prices are ruling in the market. There is no material change to notice with regard to the position of Lancashire makers of pig iron, who are still being undersold, especially by Lincolnshire and north country irons, which are offered here at very low figures. Finished iron continues very dull, and Middlesbrough bars delivered into the Lancashire district can be bought at £6, and Lancashire at £6 2s. 6d. per ton, whilst steel rails delivered into this district have been sold at as low as £6 5s. per ton.

There is every prospect of another stoppage of work in the finished iron trade, as the leading firms seem determined to enforce the reduction of 2½ per cent., which the men have resolved to resist.

# THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the North of England has fallen back into a dull inanimate state; when it should be reviving, as it generally does in the month of March, with the reopening of the Baltic ports, it is standing still, and in some instances it is going back. The gas collieries are doing a very ordinary business; the shipments generally are of coals which have been sold under contract. Second-class sorts, as a rule, have to make a little more allowance in discount before a market is found for them. Roundly stated, best and medium qualities of gas coals may be quoted at from 7s. to 7s. 6d.; second sorts at 6s. 6d. per ton. The best steam collieries are doing a fair trade at from 9s. 6d. to 10s. per ton. The second-class steam collieries are not well employed. Second-class steam sells at from 8s. 6d. to 9s. per ton, with a variance of from 2½ to 5 per cent. discount. There is a limited business transacted in house coals. Best house coals do not exceed 10s. per ton in price.

The coasting freight market has rarely been in a more depressed state than at the present moment. Freights are low for small sailing ships. They are quoted at 5s. 3d. per ton to discharge gas coals at the wharves in London river. The Gas Companies on the east coast seem to have as much tonnage as they can do with at present, and very few small sailing ships were chartered by them last week. There is the same sort of depression in the coal trade to France and Holland. The Gas Companies of the large cities on the eastern seaboard of the United States have ceased to import gas coals from the United Kingdom. They offer steamers no more than 4s. 6d. per ton freight, which the owners of vessels do not think worth while to take. They send their steamers out to Boston, Philadelphia, and other cities in ballast in preference. A little better trade is being transacted in gas coals with the Italian ports of the Mediterranean, but at low freights.

The iron manufacturers in the Cleveland district have been trying to restrict the make of pig iron; but they have scarcely succeeded in doing so. The iron market at Middlesbrough has been dull all the week. The shipments, by regular steamers, to the Baltic and the North of Europe never were fewer than they are this March.

Some small vessels have been engaged to load cargoes of fire-bricks for London at 6s. per ton, and Rochester 7s. 6d., and for Boulogne £7 10s. A fleet of between fifty and sixty sailing vessels reached the Tyne last week, from Norway and Sweden, laden with timber, mostly intended for mining purposes. There are somewhat heavy deliveries of lead from Spain.

The upward tendency in the chemical market was not sustained last week. Prices fell away a little.

# TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

As may be remembered by readers of these "Notes," it was resolved by the Police Commissioners of Wishaw, a number of months ago, to acquire the local gas supply undertaking, under the provisions of the Burgh Gas Supply (Scotland) Act; but up to the present time the transference has not taken place. In reply to a communication from the Police Commissioners, the Directors of the Company have recently stated that they cannot give an answer as to the price which they may deem it advisable to ask for the works until the Shareholders are consulted on the matter.

The report by Dr. Wallace on the illuminating power of the Glasgow gas during the week ending the 16th of March shows that the lowest minimum was 25.10 candles, which was in the Partick, or western district. In no instance was the maximum higher than 27.20 candles. In the southern, or Tradeston, district there was very little variation over the whole week, the average, maximum, and minimum being respectively 25.74, 25.82, and 25.60 candles. I find that the annual report on Scotch gas statistics, just issued by the West of Scotland Association of Gas Managers, gives the average illuminating power of Glasgow gas over the year 1877 at 26.86 standard candles.

At the last meeting of the Edinburgh Town Council, Mr. J. Falconer King's report on the quality of the gas was submitted. It stated that, on Thursday, the 14th inst., the Edinburgh Gas Company's gas gave a light equal to 27.30 standard candles, while that of the Leith Company stood at 27.40 candles. Referring to the report, the Chairman said that complaints were often heard about the price of gas in Edinburgh, as compared with that in other cities. He found, however, that in Manchester the illuminating power never exceeded 17 candles, so that in Edinburgh they were in reality getting a great deal more light for the money paid.

Mr. John Tainsh, who was for a considerable period the convener of the Corporation Gas Committee at Hamilton has lately been finding fault with what he considers to be extravagance on the part of the Committee as now constituted; and, in a letter which he has just written to a local newspaper, he says that, had the gas-works been in the hands of a private Company, no such extravagance would have been thought of. He goes on to say that he now sees it to be a mistake to have such works in the hands of representatives of the public who have little of the technical knowledge required for carrying them on successfully and economically.

The Finance Sub-Committee of the Glasgow Corporation Water Committee have agreed to recommend the Water Commissioners to continue the domestic water-rate during the current year, at the amount at present charged—namely, 8d. in the pound, and 11d. in the pound as the rate for water for domestic purposes beyond the limits of compulsory supply. They also propose to continue the public water-rate at 1d. in the pound; but recommend that certain alterations be made on the rates chargeable for supplies for other than domestic purposes. By these changes, the charge for supplies by meter will be raised from £1 13s. 4d. to £1 15s. 5d. per 100,000 gallons; all consumers of water for other than domestic purposes beyond the limits of compulsory supply will be charged 1d. per pound on the full annual value of their premises, in addition to the ordinary rates. The charges for restaurants, fishmongers, eating and coffee houses, milkshops, &c., will be reduced to 8d. per pound on the full annual value of their premises; and a fixed amount (2s.) will be charged for each horse in livery stables, and for each hearth in smithies. The estimated revenue for 1878-79 is £141,611, of which £63,906 is derivable from the domestic water-rate, £11,985 from the public water-rate, £23,988 from trade charges, and £39,495 from meter supplies.

Some doubt having been thrown upon the quality of the water obtained from the Nolt Loan well, which forms the main supply for Arbroath, the Police Commissioners of that town, in order to enable them to reply satisfactorily to the letter recently received from the Board of Supervision, have just had samples of the water analyzed by Mr. William Arnot, consulting analytical chemist, Edinburgh; Dr. Redwood, London; and Dr. Wallace, city of Glasgow analyst. Mr. Arnot describes the water as of moderate hardness, quite free from organic contamination, wholesome, and fit for all domestic purposes. Dr. Redwood considers it a good, unobjectionable water for the supply of a town. Dr. Wallace says it is too hard to be used, with comfort, for washing; but as regards purity it is unobjectionable, and compares very favourably with well water generally. Dr. Wallace indicated a fear that the water might be contaminated at some future time. Dr. Anderson, local medical officer, in presenting the reports of the analysts at a meeting of the Water Committee of the Local Authority held on Friday, pointed out that means might be taken to prevent any contamination by protecting the shaft of the well. The Committee agreed simply to report the opinion of the Analysts and the Medical Officer to the Local Authority.

At the last meeting of the Glasgow Corporation Water Committee, the Engineer's report was presented, which stated that the quantity of water in store on the 11th inst. was, in lochs, 126 days supply, and, in reservoirs, 206 days supply; and that the quantity sent into the city and suburbs during the fortnight preceding averaged 33,450,000 gallons per day.

For the fortnight ending the 23rd of February, there were 477,342,849 cubic feet of water, or 136 days supply for all purposes, in the various reservoirs of the Greenock Water-Works. The supply drawn through the main-pipes to the town was 6,104,453 gallons; supply to public works by meter, 1,900,221 gallons; and the supply for domestic purposes was 4,204,232 gallons, or 57 gallons per head per day, taking the population at 74,000.

As low as 51s. 0½d. was accepted for pig iron warrants in the Glasgow market last Wednesday; but there was a slight improvement afterwards, and the market closed on Friday with buyers at 51s. 1d. cash, and 51s. 2d. one month, sellers very near. The closing price was 3d. per ton under that of the previous Friday, and makers pigs were, in several instances, 6d. per ton lower.

The coal market is in no way improved, and coalmasters find still greater difficulty in disposing of their outputs.

WINCANTON GAS COMPANY.—A Company has just been registered for the supply of gas to this town. The capital is £2345, in £10 and £2 10s. shares.

TYNEMOUTH GAS COMPANY.—The statement of accounts to be presented at the meeting to-day shows a balance of profit of £5572 0s. 1d. The Directors recommend that the statutory dividends of £10 per cent. on the ordinary stock, £7 per cent. on the £10 shares; and 2s. 10d. on the last issue, be paid, leaving a balance of £502 7s. 3d. to be carried forward. The works are reported to be in an efficient and satisfactory state.

BEVERLEY CORPORATION GAS SUPPLY.—At the meeting of the Beverley Town Council on the 11th inst., the Gas Committee recommended that as the stock of coke was increasing, the price be reduced from 12s. 4d. to 10s. per ton. The Committee had again fully considered the charge for meters, with the result that no alteration was recommended. In the estimate for a general district rate at 10d. in the pound, it was computed that the proportion of rate at 3d. in the pound, on the gas account, on £30,318, the rateable value of property assessable, would produce £378 19s. 6d.

RICHMOND (YORKS) CORPORATION GAS UNDERTAKING.—It appears from the Corporation accounts just published that the expenditure in the gas department during the past year was £2561 18s. 3d.; inclusive of wages, £314 2s. 6d.; coals, &c., £709 6s. 8d.; meters and fittings, £89 0s. 5d.; interest on £2000 borrowed money, £121 13s. 11d.; gas-mains, £323 11s. 1d.; and extension of works, £780 15s. 1d. The income was £1644 4s. 9d., which shows a deficiency of £917 13s. 6d.

CARDIFF GAS COMPANY.—The half-yearly meeting was held on the 26th ult.—Mr. G. Phillips in the chair. The report of the Directors and the accounts were adopted, and dividends at the rate of 10 per cent. per annum on the A stock, 8 per cent. on the B stock, and 7 per cent. on the paid-up capital created by the Act of 1870, were declared payable on the 25th inst. The retiring Directors and Auditor were re-elected, and the thanks of the meeting voted to Mr. H. Bowen, the Engineer, also to the Chairman and Directors, for their attention to the interests of the Company.

REDUCTIONS IN THE PRICE OF GAS.—The report of the South Metropolitan Gas Company, just issued, states that the Directors have reduced the price of gas to 3s. per 1000 feet from Christmas last. The Seaham Harbour Gas Company, Limited, announce that the price of gas from the 1st of July next will be 3s. 9d. per 1000 cubic feet, being a reduction of 5d. This is the third reduction made by them since December, 1875. The Directors of the Sheppy Gas Company in their report announce a reduction of 3d. per 1000 from the 1st of July, in the shape of discounts on promptly paid accounts.

WEYMOUTH CONSUMERS GAS COMPANY.—The half-yearly meeting was held on the 21st ult.—Mr. Damon in the chair. The Directors report stated that the result of the half year's working, together with the balance brought forward from the last half year, enabled them to recommend a dividend for the half year at the rate of 10 per cent. per annum on the original shares, and 7 per cent. per annum on the new (1875) shares, to be declared free of income-tax, and the remaining balance to be brought



forward. The report was adopted, and thanks were voted to the Chairman and Directors, and to Mr. Stone, the Manager, for their attention to, and successful management of, the business of the Company.

**SEWERAGE AND WATER SUPPLY OF SHEERNESS.**—The Local Board of Sheerness having applied to the Local Government Board for sanction to borrow £4000 for works of sewerage and water supply, Mr. Arnold Taylor, one of the Inspectors, held an inquiry there. The works contemplated included the provision of a better supply of water for Blue Town, the completion of the plan of drainage previously approved for that part of the town, and the carrying out of certain alterations and improvements to the sewerage system in other parts, besides covering the cost of some additional works to the new well. Some of the inhabitants of Blue Town attended, and expressed a hope that this time the improvements to their part of Sheerness would be carried out, as on a previous occasion money which was borrowed for those objects was applied to other purposes.

**NEWPORT (MON.) WATER COMPANY.**—The half-yearly meeting was held on the 25th ult.—Mr. S. Homfray in the chair—when the following report was received and adopted. "The statement of receipts and expenditure of the capital and revenue accounts for the half year ending the 31st of December last is sent herewith. Your Directors recommend that the guaranteed interest for the half year ending the 31st of December, on the preference shares, be paid; that a dividend of 4 per cent. for the same period upon the ordinary share capital called up be declared, and that such interest and dividend be payable on the 9th of March next; this will leave a balance of £1214 13s. 10d. to the credit of the general revenue account. In the beginning of next month your Directors have reason to believe that your Engineer, Mr. John Taylor, will certify the works at Pant-y-r-eos reservoir to have been completed."

**WATER POWER AT HULL.**—In 1872 a company obtained parliamentary powers to pump water from the River Humber for distribution along the line of docks as a motive power for working dock gates, cranes, and other purposes. The works have recently been completed at an outlay of £17,000. Nearly a mile of 6-inch cast-iron main, 1 inch thick, with gutta-percha ring joints, has been laid, through which water is supplied at a pressure of 610 lbs. per square inch. Two pairs of high-pressure horizontal engines, of 60-horse power each, capable of pumping 180 gallons per minute at 700 lbs. per square inch, with steam at 100 lbs., have been erected. They pump into an accumulator of 18 inches diameter and 20-feet stroke, loaded with 57½ tons of copper, slag, and sand. The Company supply the high-pressure water to the Hull Docks at the rate of 4s. per 1000 gallons. The charge for working warehouse cranes is under one halfpenny per ton for a lift of 40 feet.

**THE DRAINAGE OF VILLAGES.**—A correspondent of *The Times* writes:—"An inquiry has been held at South Cave, Yorkshire, before Mr. Arnold Taylor, one of the Inspectors of the Local Government Board. This is a representative case, and the decision of the Local Government Board is looked for with considerable interest. The question is whether small rural villages, where the health is good and the death-rate lower than the average, are to be compulsorily drained at a large expense, contrary to the wish of the inhabitants. Here the death-rate was proved to have been under 13 per 1000 for the last four years, and the village entirely free from infectious diseases, while in the neighbouring village of Welton, which has been recently drained, there had been four deaths from typhoid fever, and a death-rate of 28 per 1000. In South Cave there are only 70 houses to be drained, the proposed outlay being £2000, involving an extra rate of 6d. in the pound."

**CAMBORNE WATER COMPANY.**—The half-yearly meeting was held on the 28th ult.—Mr. A. C. Wiliams in the chair. The accounts showed that there had been expended to the 30th of June last £17,206; interest and expenditure on hydrant covers raised this sum to £17,405. The receipts were £10,476 from calls, and £3000 from debentures, leaving a balance of £3929. The Directors reported that the entire works retained their general efficiency, and that, during the winter, no expenses had been incurred beyond the ordinary cost of maintenance. The bottom of the reservoir continued to improve. The revenue account showed a profit on the half year of £191, and the adverse bank balance, which, at the end of June, 1877, was £161, had been paid off, leaving a balance of £24 in favour of the Company at the end of the year. They recommended a dividend of 2½ per cent. per annum. They were gratified at the present prospects of the Company, and had strong reasons for believing that a more satisfactory future was before them. On the motion that the accounts should be passed, a lengthy discussion arose as to the propriety of extending the works through Pool to Redruth, at a cost of £8000. The matter was left in the hands of the Directors.

**ACKWORTH, FEATHERSTONE, PURSTON, AND SHARLSTONE GAS COMPANY.**—The annual meeting was held on the 6th inst. at the Company's Office, Purston. Mr. A. Wardman, the Chairman, presided, and the other Directors present were Messrs. R. Cowling, W. Shaw, J. Waller, and A. Hurst. The Shareholders in attendance were Messrs. Walker, Lodge, Ellerton, Robinson, and Holt. Mr. Watson, the Secretary, having read the report and balance-sheet, they were adopted. The Chairman then proposed that a dividend of 2½ per cent. on the half year should be declared, which, on being seconded by Mr. Ellerton, was adopted. The Chairman informed the meeting that the mains were now being laid to Ackworth, and that the whole of the shares had been taken up. The two retiring Directors, Messrs. Wardman and Hurst, were unanimously re-elected. The Auditor, Mr. Cockroft, was also reappointed. Mr. Holt suggested that the balance-sheet should be only made up yearly, but it was decided to continue to make up the accounts half yearly, as usual. A vote of thanks to the Directors and to the Chairman terminated the proceedings.

**HALESOWEN GAS COMPANY.**—The Directors annual report congratulates the Shareholders on the prosperity of the business, and states that they hopefully look forward to better results in the coming year, as the new works are nearly completed. Of the 1200 new shares of £5 each, the Directors regret that only 610 have been applied for. £2 10s. per share having now been paid on them, and, with the prospect of success the Company foreshadow, they hope to dispose of the 590 shares now remaining unsold, thereby enabling them to reduce the bank debt; otherwise, in a few months hence, they will be compelled to make further calls on the shares now allotted, at the rate of 10s. per share, at intervals of three months. The trade account shows a profit of £250 16s., which, with £34 6s. 10d. brought from the former year's account, makes a total of £285 2s. 10d. at the disposal of the Directors, after having paid interest, at the rate of 5 per cent., on the £1000 debenture bonds. This sum they propose to appropriate as follows:—By a dividend of 6 per cent. on the capital, £239 6s. 6d.; placed to reduction of suspense accounts, £30; carried forward to next year's accounts, £15 16s. 4d.—total, £285 2s. 10d.

**POLLUTION OF THE RIVER WYE.**—In the Hereford County Court, on the 12th inst., an action was brought, by Mr. John Lloyd, of Huntingdon Court, to compel the Corporation of Hereford, as the Urban Sanitary Authority, to abstain from polluting the Wye by causing the sewage of the city to flow into it. In the statement of particulars the plaintiff alleged that the defendants have, "at Eign, in the township of Tupsley,

in the city of Hereford, and elsewhere, committed an offence against the provisions of Part II. of the Rivers Pollution Prevention Act of 1876, by causing to fall or flow, or knowingly permitting to fall or flow, or to be carried into a certain stream called the River Wye, solid and liquid sewage matter;" and the plaintiff prayed that the Court would, "by summary order, require the defendants to abstain from the commission" of the offence, and give "such further and other relief" as to the Court "shall seem meet." The counsel representing the Corporation admitted the offence, but applied for an adjournment of six months. The plaintiff's counsel opposed the application, and urged the Court to make a formal order under the Act at once, but to suspend the operation of it for a reasonable time. The Judge (Mr. Smirke), however, declined to make the order, and agreed to the adjournment of the case for six months, on the Corporation undertaking to consider, in the meantime, the best means of abating the nuisance.

**WOODHOUSE GAS SUPPLY.**—On the 18th inst., a meeting of the inhabitants of Woodhouse was held to consider the price of gas supplied by the Woodhouse Gas Company, and to receive the report of a deputation appointed to wait upon the Directors. Mr. Bartholomew, one of the deputation, said the Directors had told them they were not prepared at present to make any further reduction than that proposed in the circular already issued—namely, 5d. per 1000 cubic feet. They had compared their price with those of Companies of a like character, and they found the price charged by the Woodhouse Company was very low indeed. Mr. Murfitt said the only thing that remained for them to do was to get up a requisition to the Sheffield Gas Company, asking them to extend their mains to Woodhouse. Mr. G. Markham said he should propose that they ask the Woodhouse Gas Company to supply them at 4s., and if they would not, to tell them to take the meters out. The resolution was carried unanimously. Mr. C. Taylor said he did not think the resolution was of any use, as they had the decision of the Woodhouse Directors already. He proposed that a requisition be presented to the Sheffield Gas Company to bring their mains to Woodhouse. The motion was seconded by Mr. A. Jackson, and carried unanimously, and a Committee were appointed to carry out the object of the meeting.

**TROWBRIDGE WATER COMPANY.**—The ordinary general meeting of Shareholders was held on the 13th ult.—Mr. S. Peed in the chair—when the Directors submitted a report recommending a dividend on the consolidated stock at the rate of 2½ per cent., payable on the 1st inst., free of income-tax. The accounts showed that the actual amount of net earnings during the past year was £672 2s., being an increase of £285 6s. 2d. over the preceding year, when the actual net amount earned, after deducting the previous balance in hand, was £387 15s. 10d. The Directors stated that the unusually wet season last year had interfered with the consumption of the water; nevertheless, the increase in the water-rental was satisfactory, and they looked with confidence to the still further development of the undertaking for the supply of the pure and wholesome water at their command. The purchase of Yarnbrook Mill had been completed, and the Company took possession on the 31st of December last. The Engineer, Mr. H. Tomlinson, reported that during the past year water from the Company's works had been laid on to 215 premises, the income from 205 of these being £140 per annum. The remaining ten services were supplied through meter, and the amount derivable therefrom was indefinite. The total number of premises now supplied was 1217, and of these 66 were through meter. The general condition of the Company's works was satisfactory. At the close of the ordinary business a special general meeting was held, for the purpose of obtaining the approval of the Shareholders to the Bill now before Parliament, for extending the water supply by the Company to Westbury, Bradford-on-Avon, and Melksham.

**TRURO WATER-WORKS COMPANY.**—At the half-yearly meeting on the 26th ult., the Directors reported that calls had been received to the end of the year upon 136 of the 172 shares allotted. Further calls had, however, been received since the closing of the year on 35 shares, and 14 more shares had been allotted. The negotiations for acquiring the necessary land for the construction of the works had been brought to a successful termination. The purchase-money had been paid. The Contractor had duly signed his contract, and taken possession, and was now proceeding to execute the work. It had been deemed advisable, for the protection of the Company in case the works should not be completed before the expiration of the time allowed in the Act—namely, the 29th of June next—that application should be made to Parliament for an Act for the extension of the time. The report of the Engineer stated that the whole of the necessary pipes had been delivered. The site for the engine-house, &c., was being levelled, and the filter-bed was in a forward state. The engine purchased at South Carn Brea Mine had been brought to Truro, and was now under repair. The statement of accounts submitted showed receipts from a first call on 186 shares, £372; less unpaid, £100—total, £272. The purchase-money for the land was £500, thus leaving a balance due to bankers of £228. The reports and statement of accounts having been adopted, the meeting was made special, and a resolution adopted sanctioning the Bill for an extension of time.

**CHESTERFIELD WATER AND GAS COMPANY.**—The half-yearly meeting was held on the 27th ult.—Mr. R. T. Grattan in the chair. The accounts presented showed a balance of profit on the half-year's working of £5808. The report stated that the Northern main, which supplies in bulk and also distributes water to the whole of the district north of Chesterfield up to the boundaries of Dronfield and Coal Aston had been completed some months. The report and statement of accounts were adopted, and a dividend of £2 10s. per cent. for the half year (at the rate of 5 per cent. for the year) was declared on £49,200 preference shares and guaranteed stock; £3 10s., or 7 per cent. per annum, on £58,540 £10 shares; £15, or 30 per cent., on £11,200 ordinary stock, being 5 per cent. for the last half year and 10 per cent. in respect of deficiencies in dividends in previous years; and £5 5s., or 7 per cent. per annum, on £6914, being the deposit and first call on ordinary shares issued in 1876. Messrs. Lancaster and Burdett were re-elected Directors, and Mr. Shaw was re-appointed Auditor. In proposing a vote of thanks to the Chairman for presiding, Mr. Pawson (Sheffield) congratulated the Shareholders on the possession of such a prosperous undertaking, and pointed out that the new works of the Company were likely to prove a great benefit to the neighbourhood. A vote of thanks to the Directors concluded the proceedings.

**SHOREHAM (SUSSEX) GAS SUPPLY.**—At the meeting of the Shoreham Local Board, on the 19th inst., the Committee appointed to consider the quality and the price of the gas supply of the town, recommended that the Clerk be instructed to apply to the Brighton and Hove Gas Company to supply their customers in this district at the price charged to consumers in Brighton and Hove, which was 3s. 6d. per 1000 feet. If this application were granted, the Committee were of opinion that no better arrangement could be made. If the Company declined to reduce the price to 3s. 6d., then the Committee recommended that an application be made to the Company to know the terms on which they would sell their plant, pipes, &c., in the district, so that the Board might consider the desirability of undertaking the manufacture and supply of gas on account of the rate-payers, or of encouraging the formation of a private Company for such purpose. Mr. Green, in moving the adoption of the report, observed that



the price formerly paid by the consumers was 3s. 6d. per 1000 feet. When the price of coals increased this was raised to 4s. 6d.; but, though coals were now lower, a corresponding reduction had not been made in the gas supplied to Shoreham, though the charge at Brighton and Kingston was only 3s. 6d. By the 162nd section of the Public Health Act, the Board had power to purchase the plant of the Company, or to erect, if necessary, gas-works of their own. The report was unanimously adopted, and the Clerk was directed to write to the Company in accordance therewith.

**HYDRAULIC LIFTS FOR PURIFIER COVERS.**—We hear that Messrs. John Abbot and Co., Hydraulic Engineers, of Gateshead and London, have recently received instructions to apply their improved hydraulic apparatus for lifting and lowering purifier covers, to 16 new purifiers, 30 feet square, now being erected by Messrs. C. and W. Walker, for The Gaslight and Coke Company, at their Beckton works. Each purifier is provided with a stop-valve, and also a special lifting and lowering valve, worked by a hand-lever. By this means one boy can, if necessary, lift six covers in less than five minutes. The pressure (700 lbs. per square inch) is obtained from a small and specially adapted accumulator, which is lifted by force-pumps, and intended to be attached to the Company's existing engine for working the scrubbers. The covers, which are lifted from the centre internally, will have a clear lift of 7 feet above the top of the lutes, and 6 feet 6 inches when resting on the catches fixed on standards, and as the purifiers are placed outside, they will act as a covering for the men when engaged in charging the apparatus. The designs of these lifts have been carried out, we understand, under the direction of Mr. J. Coates, C.E. (for many years with Sir W. G. Armstrong and Mr. T. Hawksley), and who, we presume, will superintend the erection of the apparatus on behalf of Messrs. Abbot and Co. The principle was first applied many years ago at Beckton to round purifiers by Mr. V. Wyatt, the Constructing Engineer of the Company's works at that place. Looking at the amount of manual labour saved, and the comparatively small cost of this arrangement, there seems every probability of engineers and managers of other large gas-works adopting the same plan, especially when it is borne in mind that the power can be applied to any cranes or hoists required on the works.

**A RARE OPENING.**—A local contemporary says: "In answer to the following advertisement, I understand a good many applications have been received:—

—GAS COMPANY.

THE Company are in WANT of a competent PERSON as Secretary. He must thoroughly understand the keeping of accounts, and will be required to inspect the whole of the consumers' meters (a scattered district) at least once a quarter, to collect all accounts, and generally superintend the management, making and distributing of about 10 million cubic feet per annum.—Application by letter only, enclosing testimonials, &c.

The following is a copy of one:—"Sir,—I beg to offer my services for the situation vacant at your gas-works. I have just returned from Chicago, where, at the gas-works there, I was Chairman of Directors, Gas Engineer, Chief Secretary, Head Book-keeper, Cashier, Collector of Accounts, Inspector of Meters, and Chief Stoker. I found, however, that I was not quite equal to laying all the mains and repairing the meters, as the Company wished, so we parted. But I guess as your gas system ain't quite so large as that of Chicago, I might be able to throw in your gas-mains and repair your meters, to the bargain. I have an iron constitution, with a character and intellect to match. You appear to offer no salary, but as it would be a waste of time to draw a salary, and might distract my attention from the duties of the situation, I will forbear mentioning that little matter, and as my clothes are all made without pockets, I think I am just the man to suit you. The nature of my qualifications are such that I am a whole gas-works rolled up in one individual. You will thereby perceive the propriety of me writing my own testimonials, which I assure you are perfectly genuine. You say you have 10 million cubic feet of accounts to make, distribute, and collect per annum. Well, although we never reckoned our accounts in America by the cubic foot, I'll engage to do it against any Britisher in these parts, and work a spell at moon-raking occasionally besides.—Yours, &c., PERPETUAL JACK, Vulcan Villa."

**LIVERPOOL WATER SUPPLY.**—DEEP BORING AT BOOTLE.—On Monday, the 18th inst., Mr. George H. Morton, F.G.S., read a paper before the Literary and Scientific Society of Liverpool on the deep bore-hole now being sunk by the Corporation at Bootle. Having given a description of the strata already passed through, in carrying the well to its present depth of 700 feet, he made some comments on the probable result. He stated that the intention is to bore down to the depth of 1000 feet, where an impermeable stratum is said to be expected, and the object seems to be to obtain water from a source that will not interfere with the supply already obtained from the existing bore-holes, one of which is about 600 feet deep. Although the geological sequence of the strata in this neighbourhood is known, and the pebble-beds of the Bunter formation occur at the surface around the water-works at Bootle, the particular horizon of the subdivision that occurs at that place was very uncertain before the boring was commenced, and there appeared some data for supposing that it would begin so low down in the pebble-beds that the coal measures might be reached before the depth of 1000 feet had been attained. Now, however, that the rock has been penetrated to the depth of 700 feet, the exact position of the strata passed through is proved, and, though the boring has not been completed, the section was of sufficient interest to bring before the Society. In the section exhibited, Mr. Morton explained that the entire thickness of the strata is 1000 feet, and the black line down one side represented the depth of the boring—701 feet that day at noon. Near the surface there is a bed of boulder clay, which was originally covered by a bed of sand; but the latter has been disturbed by building operations. The upper 400 feet of rock is a hard red sandstone, with thin bands of red marl at intervals, similar to that seen in the yard belonging to the water-works, and in a large quarry in Hawthorne Road. At the depth of about 420 feet the strata begin to contain many quartz pebbles, and they continue numerous for about 250 feet, when they decrease in quantity, and the rock assumes much the same character as in the upper portion of the boring. In hardness and colour the whole of the rock presents a very uniform appearance, and evidently belongs to the pebble-beds from the surface down to the bottom of the bore-hole. The maximum thickness of the pebble-beds having been passed through, indications of the underlying lower Bunter may be expected, but the occurrence of any impermeable bed before the coal measures are reached is very improbable, and they are not likely to occur within the limits of 1000 feet. In conclusion, the author stated that the lower Bunter was of a soft, porous character, and that he had no doubt that a much larger supply of water would be obtained, the natural result of the great depth and width of the bore-hole, which is 26 inches in diameter.

## Register of New Patents.

3855.—HUGHES, R. H., Hatton Garden, London, "Improvements in means or apparatus employed to indicate the waste or overflow of water from cisterns and other receptacles." Patent dated Oct. 5, 1876. This invention has for its object improvements in means or apparatus

employed to indicate the waste or overflow of water from cisterns and other receptacles, and relates to the employment of means to indicate audibly such waste or overflow. For this purpose the waste or overflow water is conducted or directed to a water-wheel, or other rotating contrivance of any suitable construction, such, for instance, as a turbine or emission engine, and gives rotary motion thereto. This wheel or rotating contrivance is provided with projections or other suitable means to sound a bell, gong, or other audible alarm apparatus to call attention to such waste or overflow.

3863.—TURNER, D., Dalston, "Improvements in apparatus for burning hydrocarbons for lighting and heating purposes." Provisional protection only obtained. Dated Oct. 6, 1876.

The object of this invention is to construct apparatus for burning hydrocarbons with safety, economy, cleanliness, and regularity of flame.

The invention primarily consists of a particular construction of burner, preferably in the form of a hollow cone or cylinder, closed at the top, which fits or is placed upon a pipe to which the oil or hydrocarbon is supplied, the cone or cylinder being pierced with any desired number of holes, in rows or otherwise, to form jets. The invention also consists in the combination of an oil reservoir, on the principle of a "bird fountain," with a burner or burners placed at such a distance therefrom that the reservoir is quite out of contact with the flame or burners.

3880.—GREEN, H., Preston, "Improvements in coal gas scrubbers, and apparatus for distributing liquid for other purposes." Patent dated Oct. 7, 1876.

In this improved scrubber, the scrubbing or washing of the gas, to remove ammonia and other impurities, is effected in a vessel or chamber provided with divisions, and containing coke or other substances, arranged in tiers as usual. At the upper part of the vessel is a central vertical pipe, capable of being rotated by suitable gearing, which may be arranged with eccentric wheels to give a differential speed to the central pipe. The lower end of this pipe is provided with a branch pipe, arranged to form, in conjunction with the central pipe, a liquid trap for preventing escape of gas, and to serve also as a bracket for carrying a bearing, in which works, as a swivel, the axis of a wheel. The wheel axis carries a liquid-distributing pipe in communication, through the said axis, with the branch and central pipes. As the central pipe is rotated, it carries round with it the branch and distributing pipes, whose wheel, with its prolonged axis or swivel, is caused to rotate simultaneously, by contact of the wheel with the teeth or inner edge or periphery of a fixed annular wheel or ring. Thus the distributing pipe, whilst travelling around the central shaft, rotates also upon the swivel which constitutes its axis.

Liquid distributing apparatus, according to this invention, may be applied in other cases where it is requisite to distribute streams of liquid to meet gas or vapour, as, for example, to absorbing towers or vessels, and to towers or vessels used for the purpose of distillation.

In conjunction with this improved distributing apparatus, when used in coal-gas scrubbers, a motor is sometimes applied, somewhat resembling the case or cylinder or drum of a meter, and which is connected with the distributing apparatus, so as to drive it by the pressure of the flowing gas. This last-mentioned arrangement is more particularly designed to dispense with steam power in small gas-works.

3882.—M'KENDRICK, J., BALL, H. W., Glasgow, and WATSON, R. G., Kilmarnock, "A new or improved fluid motor, pump, or meter, and valves and valve-gearing therefor." Patent dated Oct. 7, 1876.

This invention has reference to a new or improved construction of reciprocating piston engine, with from one to four double-acting cylinders and a revolving shaft, and a new or improved construction of single revolving valve for the admission and emission of the water or other fluid for the whole of the cylinders, all specially suitable as a water engine, pump, or meter, while also applicable as a steam, air or other elastic fluid motor, or as a blowing or forcing engine.

3884.—MARTIN, J. R., Shoreditch, "Improvements in rotary pumps and engines." Patent dated Oct. 7, 1876.

These improvements consist in the employment or use of rings, in connection with the sliding pieces or strips forming the piston, in such manner that the friction between the piston and interior of the cylinder in rotary pumps and engines, exhausters, blowers, &c., is entirely avoided, by reason of the rings revolving with the piston slides, and not bearing on any stationary or fixed part, for the purpose of keeping the piston slides to or against the interior of the cylinder.

3894.—YOUNG, W., NEILSON, A., and YOUNG, A., Clippens, N. B., "Improvements in the destructive distillation of bituminous substances, and in the apparatus or means employed therefor." Patent dated Oct. 9, 1876.

The patentees claim, first, constructing and arranging retorts for the destructive distillation of shale, coal, and other bituminous substances with their lower ends considerably contracted, and provided with a fixed box or chest, having a hole through it corresponding to the opening in the retort, and containing a sliding plate made of iron, fire-brick, or other suitable material, for closing the bottom of the retort, another sliding plate or block being also provided to close the opening from the retort into the combustion chamber, atmospheric air and the products of combustion from the chamber being excluded from the retort, whilst in operation, by a jet of steam, or by a current of permanent gas induced into the box or chest, and through the retort by steam, either mixed with the permanent gas or separately, conducted into the apparatus, or by a mechanical exhausting or pumping arrangement; and, second, retorts for the destructive distillation of shale, coal, and other bituminous substances, with a narrow or thin space, preferably of from six to twelve inches, the width of the space being dependent upon the amount of fixed carbon in the coke residue resulting from the distillation of bituminous substance, and whereby the distillation, and especially downward distillation, is hastened, and fuel economized.

3905.—WILDY, W. L., Martin's Lane, London, "Improvements in cocks or valves for gas-fittings." Provisional protection only obtained. Dated Oct. 10, 1876.

This invention relates to improvements in cocks or valves for gas-fittings, and consists in placing in an elbow, swivel, branch, or any convenient place in a gas bracket, gaselier or pendant, or in the pipe leading to the burners, a suitably constructed plug or tap, bored for the passage of gas, and around which, in the line of the gas way, there is a shallow groove, only large enough for a minimum quantity of gas to pass. By turning the plug, the gas flame is either raised or lowered, according to the position of the gas way, but in no case is it possible to extinguish the gas.

3914.—AHREBECKER, H. C., Stamford Street, London, "Improvements in fluid-meters." Patent dated Oct. 10, 1876.

According to this invention, a hollow cylinder is constructed, capable of rotating on supports in the line of its axis, and containing one or more helical or screw blades, which are fixed both to the sides of the tube and to the centre spindle thereof, thus forming one or more helical passages between the blades. The tube is placed in a cylindrical chamber, and is open at both ends, fitting with its one end closely against a plate closing the one end of the chamber. In this plate are formed a number of oblique



holes, sloping in a contrary direction to the inclination of the screw blades, and adjustable in area by a rotatable plate with corresponding holes. The fluid to be measured being made to enter through these holes, impinges in oblique jets upon the screw blades, and then flows through the helical passages, whereby rotary motion will be imparted to the tube, and this motion is conveyed by a worm on its spindle to the registering mechanism in any known manner.

3916.—SHAND, J., Upper Ground Street, "Improvements in hydrants or fire-cocks, and an auxiliary valve in connection with the same." Patent dated Oct. 10, 1876.

This invention relates to an improved construction and arrangement of hydrants or fire-cocks, and has for its object the means of effectually preventing hydrants from being damaged by frost, and the inconvenience and danger of having water mains and branches shut off for effecting repairs. For the purpose of carrying out the invention, a sluice-valve is used with the sliding-valve formed hollow, to allow of the actuating screw being inside it. At the lower part of the sliding-valve is a projection with a T-slot in it. In this slot is fitted loosely the top end of a small gun-metal plunger, which is moved up and down by the sliding-valve. In the centre, and below the sliding-valve, a cylinder is formed on the sluice-valve case, and bored out accurately in a line with the actuating screw. The plunger is fitted to this cylinder, and in a certain part a hole is drilled through its diameter. A corresponding hole is drilled through the cylinder, and opens a communication to the interior of the hydrant, the sliding-valve being then in a position to shut off the water. When the apparatus is in this position, the whole of the water remaining in the hydrant outlets escapes; but on the sliding-valve being screwed up to admit the water through the hydrant, the plunger rises with the sliding-valve, and closes the opening in the cylinder, thus preventing any escape while the sliding-valve of the hydrant is being opened. The plunger may be packed with hydraulic leathers or hemp to prevent leakage, but preference is given to a hollow plunger made a good fit to the cylinder.

3939.—BARNES, J., Accrington, "Improvements in water or other fluid-meters or motors." Patent dated Oct. 12, 1876.

This invention consists in a new arrangement of parts composing a meter for the measurement of fluids, applicable also as a motor. Four cylinders or boxes are placed round a central crank-shaft. One pair of cylinders face each other on opposite sides of the shaft, the other pair are similarly arranged at right angles to the first pair. The axes of all the cylinders are preferably in the same vertical plane, or nearly so; each cylinder has a piston, and each pair of opposite pistons is rigidly connected together by a rod, on which (and forming an integral part of it) is a link with a long transverse slot. In this slot the crank-pin, or a journal round the crank-pin, works, the two piston-rods and links being so arranged as to pass each other, and actuate the same crank-pin at right angles to each other. The end nearest the crank-shaft of each cylinder is open, the other end closed, but provided with a port leading to a central valve forming a part of the crank-shaft, or securely fastened thereto, and rotating with it on a circular valve-face, with four induction ports in a ring, and a central port in and below the valve forming the discharge orifice. The whole is enclosed in a casing.

3949.—BROOK, E., and WILSON, A., Middlesbrough-on-Tees, "Improvements in apparatus for making gas." Patent dated Oct. 12, 1876.

According to this invention the apparatus consists of a cupola-shaped furnace, which may be either square or round in cross section. Vertically it may be described as consisting of two sections or parts—viz., an upper retort and a lower combustion chamber, and it is an essential feature of the invention that the gas is taken off at the point where the two meet.

The upper retort is of the form of an inverted cone or frustum of a pyramid, and it is furnished with a hopper at the top, through which the fuel is fed. The lower combustion chamber has a solid hearth, on which the ashes are allowed to accumulate, and a little above the hearth are a series of tuyeres or openings through which the air required for combustion is forced, by means of a steam jet or a blower of any description, and it is furnished with a door at the bottom, for the removal of the ashes from time to time.

At the point where the retort and the combustion chamber meet, there are a series of lateral openings slanting upwards, and leading to a space or channel which surrounds, or partly surrounds, the retort; through these openings the generated gas passes, and it is taken off for use at any part of the channel.

3958.—WOLSTENHOLME, J., Radcliffe Bridge, "Improvements in steam-pumps or pumping-engines." Provisional protection only obtained. Dated Oct. 13, 1876.

This invention relates to the description of pumps which have steam-valves controlled without the aid of revolving shafts, and consists of arrangements for effecting the movements of these valves.

3965.—STEEL, J., Glasgow, "New or improved apparatus for purifying and condensing gas, and for extracting and collecting ammonia therefrom." Patent dated Oct. 13, 1876.

The apparatus, as constructed according to this invention, consists of long cylindrical vessels of boiler plate or other plates, rivetted or bolted together, and having closed ends. These vessels are carried on two, three, or more sets of rollers, so that as power is applied to drive the rollers the cylindrical vessels are slowly rotated. The vessels are divided internally all round, by means of longitudinal and transverse partitions, into a continuous series of receptacles, which have the effect, whilst the vessels rotate, of partly lifting up the water, lime water, or other condensing or purifying liquid or substance with which the vessels are charged, and, by thus regulating the charge, to move gradually through the vessel, discharging it after it has been carried some distance upwards, at the same time preventing the lime water or other purifying liquid from passing, except at a very slow rate, from the admission towards the discharge end of the cylindrical vessels.

A series of long narrow troughs or dippers also extend from end to end of the cylindrical vessels, and these also carry brushwood or wire projecting towards the centre of the apparatus, so that when the water, lime water, or other condensing or purifying liquid, lifted by the successive troughs or dippers as the vessels rotate, has been carried to the desired height, it is upset over the brushwood or wires, or allowed to fall in a shower, thereby exposing a very extended surface to act upon the gas passing through the condenser or purifier.

The extent of surface kept in a wet state by the water or lime water may also be further increased by placing at intervals transverse divisions, alternately having a passage for the gas at the centre and the circumference. These divisions dipping partly into the lime water, or other purifying liquid in the lower part of the rotating condenser or purifier, as well as by the continuous trickle of the liquid from the brushwood or wires, are kept constantly moist, and by virtue of the openings for the passage of the gas being alternately at the centre and circumference, the gas is caused to be more thoroughly mixed. Gland joints are provided at the axis of the cylindrical vessels, both at the ingress and egress ends, for the inflow and outflow of the gas; and this, not having to pass through a column of water, as in other purifiers, may be sent through it at a lower pressure.

The arrangement which is above described may be reversed—that is to say, the outer cylindrical vessel may be kept stationary, and a shaft passed through it capable of being rotated. Upon this shaft the troughs or dippers, transverse divisions, as well as the brushwood or wires, are carried, and as it is rotated these agitate and lift up the liquid after the manner before described with reference to the rotating vessel.

This new or improved form of apparatus applies both to condensers, ammonia collectors, and purifiers; but another form of condenser consists of a circular vessel of boiler plate, over which a shower of water may be let fall, or which may rotate in a trough of water or other refrigerating liquid at its lower part, so that a continuous cooling and condensing effect is obtained by the constant evaporation of moisture from that portion of the surface of the vessel which is exposed to the action of the atmosphere. The current of water through the trough passing in the opposite direction to that of the gas through the condensing vessel, the interior of the condensing vessel may have a shaft with arms passing through it for the purpose of revolving and mixing the contents.

This apparatus may be used in two ways—that is to say, in the first place the first vessel, constructed after either of the arrangements described, may serve the double purpose of a condenser and ammonia collector, after which the uncondensed portion of the gas is passed on to another vessel or vessels of similar construction, containing the purifying liquid or pulverized purifying substance. Under a second mode of applying the apparatus, it may be divided into three principal sets or divisions—that is to say, one set or division for condensing the gas, a second set or division for purifying it, and a third set or division for collecting the ammonia.

4002.—PENNING, J. R., Landport, "Improvements in apparatus for indicating the pressure of elastic or non-elastic fluids." Provisional protection only obtained. Dated Oct. 17, 1876.

In carrying out this invention there is attached to the aperture through which the steam, air, or other fluid is admitted to the pressure-gauge, a cock fitted with a plug, operated by a handle in the usual way. The cock has two openings opposite, and in a line with each other, to one of which the pressure-gauge is screwed or connected, whilst the other is connected to a pipe through which the fluid, the pressure of which is to be indicated, is supplied. The plug of the cock has a straight hole through it, which opens a communication through the cock when the handle is in a line with the latter. Through the plug, a second hole is made from one side at right angles to the first, but only half way through the plug, so as to communicate with the hole first described, and a corresponding hole is made in one of the sides of the cock at right angles to its length.

4014.—HOWARD, J., Peckham, WILSON, A. F., and KINGDOM, H. W. A., Southwark, "Improvements in apparatus for controlling and arresting the flow of fluids and prevention of waste of water." Provisional protection only obtained. Dated Oct. 13, 1876.

A cylinder of any suitable material, such as brass, is fitted with a piston, the top and bottom of which may be fitted with cup leathers, or packed so as to fit the cylinder. This piston has a hole through it, and is attached to an actuating piston-rod, furnished at the top with a ring or other fitting. The bottom of the cylinder is closed by a metal disc, which extends beyond the cylinder as a flange, upon which a ring of metal or other material can rest as a weight. To the under side of this disc is attached a leather or other washer by means of a screw, which may be lengthened, so as to act as a guide to the weighted cylinder in its descent upon the seating of the valve or water way. The top of the cylinder is closed by a cap, through which the actuating piston-rod passes. The piston-rod is weighted, so that when released it will pass back to the bottom of the cylinder, displacing the fluid beneath, which will pass through it to its upper side.

4015.—REYNOLDS, E., Sheffield, "Improvements in centrifugal pumps and fans." Patent dated Oct. 18, 1876.

This invention relates to pumps and fans acting by centrifugal force; i.e., wherein a series of blades or vanes, being made to revolve round an axis, draw fluid in at the central part of the apparatus, and eject it at the circumference, thus producing a stream in the channel to which the central orifice of the apparatus is applied. For this purpose the apparatus is constructed somewhat in the form of that kind of turbine known as the Fournigrion turbine, providing an inner series of fixed curved blades which act as guides to direct the fluid towards another series of blades that revolve outside and around the former. The fluid being thus drawn in through a circular aperture on one side of the apparatus, and being ejected at the circumference, the channel containing the fixed guides is made of a conoidal form, having a curvature such that the change of direction in the movement of the fluid is rendered easy. The fixed guides within this conoidal channel have such a curvature that as they recede from the axis they are directed more and more in the direction in which the outer vanes revolve, thus guiding the fluid from a radial towards a tangential direction before it reaches the latter.

4036.—VANDENDRIESCHE, A. E., George Yard, London, "An improved gas-regulator designed for the purpose of being applied to burners of every description, without altering the original appearance of the fittings." A communication. Patent dated Oct. 19, 1876.

This invention consists of a small apparatus, which is introduced into the gas-pipes at any part; it is invisible from the outside, and, consequently, can be applied to any kind of burner, as it does not in any way alter the appearance of the fittings, nor raise the burner above its original position, as is the case with most regulators.

The regulator is made according to the size required by the inside diameter of the gas-pipe for which it is intended. It is composed of two pieces fitting into each other. The outer piece is hollow, and at one end is partially closed, leaving only an opening at the bottom. The inner piece, screwed inside, is pointed at its end; it is also hollow, but not throughout, the cavity communicating with the hollow portion of the outer piece through an opening cut on the side. The point at the end of the inner piece fits in the hole at the lower part of the outer piece, partially closing it. It is evident that the more the inner piece is screwed down into the outer piece the smaller does the opening become, the greater is the friction, and the less gas passes through the aperture; the quantity of gas consumed may thus be regulated as desired.

4070.—ALLEYS, Glasgow, "Improvements in and connected with sluice and other valves, and in machine tools for making them." Provisional protection only obtained. Dated Oct. 21, 1876.

This invention comprises various improvements in the constructive details of sluice and other valves, and of accessory parts, and in machine tools for making the valves.

4085.—SIEVIER, J. C. H., Holloway, "Improvements in the manufacture of gas, and in the apparatus to be employed therein." Application dated Oct. 23, 1876. [Void by reason of the patentee having neglected to file a specification in pursuance of the conditions of the letters patent.]

This invention relates to certain improvements in the manufacture of gas, and in the apparatus to be employed therein. The first and chief feature of it is to dispense with the present necessity of excessive heat in the retorts, and to effect the decomposition, distillation, and elimination of



the constituent elements without destructive distillation, the principle being to work in *vacuo*.

4087.—KING, J. T., Liverpool, "Improvements in chandeliers, brackets, and bracket arms, and in apparatus employed in the manufacture of the same." A communication. Patent dated Oct. 23, 1876.

By these improvements, as applied to gas-burning chandeliers and brackets, metallic gas-pipe or tubing is employed for conducting the gas to the burners, and these metallic pipes or tubes are encased, on such of their sides as are exposed to observation, with pressed glass tubes on the vertical pipes, and with U-shaped or open-sided pressed glass trimmings on the laterally projecting metallic bracket pipes, and these are so attached to the metallic pipe that the latter will support the trimmings and casings so attached.

4089.—BALCON, W., Kingsland, "An improved lamp-lighter." Provisional protection only obtained. Dated Oct. 23, 1876.

The body of this apparatus consists of a light metal receptacle for oil or spirit, and has at the foot thereof a screw or other means for attachment to a stick or rod. The upper end of the receptacle terminates in a tube for a cotton wick, and at the lower part is an aperture tapped for the reception of a screw plug. To the tube at the head of the receptacle a hood or screen is applied or slipped thereon, open on one side, and serving to screen the light. In charging the lighter, the wick is fed through the aperture at the lower end, and passes out through the wick-tube at the upper end; the receptacle is then charged with the oil or spirit, and the screw plug is turned into its place to close the receptacle.

4095.—BURDEN, G. T., Birmingham, and NOWELL, J., Aston, "Improvements in meters for measuring water and other liquids." Provisional protection only obtained. Dated Oct. 23, 1876.

The body of a meter constructed according to this invention consists of a conical case or chamber, the inlet-pipe for the water or liquid being connected to the wide end, and the outlet-pipe to the narrow end of the conical case or chamber. In the axis of this conical case or chamber an Archimedean screw, or a screw consisting of a series of inclined blades, is situated. This screw is conical, following the general conical figure of the case. The blades of the conical screw fit as closely against the sides of the conical case as is compatible with perfect freedom of motion in the screw, or the screw may work in a case fixed inside the meter-case. The shaft of the screw is mounted on the axis of the case upon centres, so that the screw may rotate with little frictional resistance, the centres taking into seats or recesses in the ends of the screw-shaft. These centres are carried by cross pieces or bars on the case, and are screwed and capable of adjustment in screw-boxes in the cross pieces or bars. The water or liquid to be measured enters the case or chamber of the meter by the inlet-pipe at its wide end, and the current, by striking against the blades of the screw in the case, gives a rotatory motion to the screw. The current of water or liquid, after it has thus acted upon and given rotation to the screw, escapes from the meter by the outlet-pipe at the narrow end of the case.

4106.—LEONI, S., St. Paul Street, New North Road, "Improvements in the construction of boilers to be heated by gas." Patent dated Oct. 24, 1876.

This invention consists in the construction of boilers for the production of hot water and steam, composed of a number of separate steam-tight tanks or chambers, connected together by communicating pipes, and enclosed within an outer casing, heat being applied by gas to the under surface of the lowest set of tanks or chambers, and acting through them on the upper tanks or chambers by means of their communications.

Each separate tank or chamber is furnished with a man-hole, by means of which it can be cleaned out as required. By constructing boilers in this manner, a considerable increase of heating surface is obtained, with great facility for keeping them clean, and, thereby, preventing incrustation when in use; large quantities of hot water can be produced with a comparatively small expenditure of gas, and such boilers are not liable to get out of order. These boilers, when intended to be used for supplying steam to an engine, are fitted with a steam-chest for the purpose, which can also be used to supply steam for ordinary household or kitchen use. A hot closet or a grill may also be fitted over the boiler if required, such grill being heated by an atmospheric gas-ring.

4109.—WALKER, J., Glasgow, "An improved fluid-meter." Patent dated Oct. 24, 1876.

This apparatus comprises a cylinder mounted on a journal or bearing so as to oscillate to a limited extent. An external catch, engaging with a snag formed on the cylinder cover, holds one end elevated until the pressure of the water forces a piston in the cylinder from the lower up to the raised end, whereupon the piston, which has no rod attached to it, causes a pin, passing through a nipple in the cylinder cover, to release the catch, and so allow the cylinder to be tilted by the weight of the piston. A similar contrivance at the other end of the cylinder then operates, and holds the cylinder in its reversely inclined position until the piston returns and liberates the catch. Water or other fluid to be measured is led into the cylinder through ports formed in the journal, and communicating with the cylinder passages; outlet ports being also provided in the journal. A pawl attached to any convenient part of the cylinder acts on a train of ordinary counting gear.

#### APPLICATIONS FOR LETTERS PATENT.

1032.—WEBSTER, G. E., Nottingham, "Improvements in gas-burners and their accessories." March 15, 1878.

1033.—LAKE, W. R., Southampton Buildings, London, "Improvements in furnaces applicable for heating steam-boilers and gas-retorts, and for other like purposes." A communication. March 15, 1878.

1077.—WALLER, G., and COLYER, F., Southwark, London, "Improvements in apparatus used in the manufacture of gas." March 19, 1878.

1092.—MORGAN-BROWN, W., Southampton Buildings, London, "Improvements in fluid-meters." A communication. (Complete specification.) March 19, 1878.

1094.—STOCKMAN, B. P., Westminster, "Improvements in and relating to apparatus for utilizing mineral oils for lighting purposes." March 19, 1878.

1096.—LAKE, W. R., Southampton Buildings, London, "Improved appa-

ratus to be connected with the stopcocks of gas-pipes for opening and closing the same." A communication. March 19, 1878.

1105.—LAKE, W. R., Southampton Buildings, London, "Improvements in water-meters." A communication. March 20, 1878.

1109.—COUGNET, J., and POTEI, A. P., Brussels, Belgium, "New or improved apparatus for injecting, exhausting, and forcing fluids, which apparatus is also applicable for other purposes." March 20, 1878.

1135.—GOODFELLOW, G. B., Hyde, Chester, "Improvements in the construction of pistons and pump buckets." March 21, 1878.

#### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

3603.—ADAMS, G. A., Peel, Isle of Man, "An improved meter for taps or other similar articles." Sept. 26, 1877.

3876.—PITT, S., Sutton, Surrey, "Improvements in producing, purifying, and regulating gas, and in apparatus employed therein." A communication. Oct. 19, 1877.

4309.—ROBERTSON, S., Old Broad Street, London, "Improvements in slide valves and cocks." Nov. 17, 1877.

216.—WRIGHT, F., Westminster, "An improved governor for gas-burners." Jan. 17, 1878.

219.—GRADDON, J., Clapham, London, "Improvements in machinery for pumping or forcing fluids for motive power or other purposes." Jan. 17, 1878.

#### PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

286.—CORY, E., "Improvements in motive-power engines, also applicable to pumps or measures for air, gases, or liquids." Jan. 25, 1875.

360.—LAMBERT, C., "Improvements in filters or apparatus intended chiefly to clear rain water during its flow from roofs to reservoirs." Jan. 30, 1875.

399.—RYDILL, G., "Improvements in the process of and apparatus for treating and purifying sewage and polluted waters, which improvements are applicable for collecting the soap, grease and oils for the manufacture of gas, and for removing incrustation in steam-boilers." Feb. 3, 1875.

400.—JOHNSON, R., "Improvements in machinery for obtaining motive power for raising, forcing, and exhausting fluids and liquids, and for measuring liquids." Feb. 3, 1875.

417.—CHAMEROY, E. A., "Improvements in cocks for water, steam, air, or gases." Feb. 4, 1875.

425.—CROMBIE, E. E., "Improvements in dry gas-meters." Feb. 4, 1875.

439.—WIRTH, F., "Improvements in valves." Feb. 5, 1875.

442.—STUART, C., "Improvements in stop valves and taps." Feb. 5, 1875.

558.—OUTERSON, J. and A., "An improved filter." Feb. 16, 1875.

573.—HALLSWORTH, S., and BAILES, R., "Improvements in the method or means employed in treating and clarifying sewage or other impure waters." Feb. 17, 1875.

590.—PEACOCK, J. C., and RUDKIN, T., "Improvements in apparatus for cooking and boiling by means of gas." Feb. 18, 1875.

623.—SPER, R., and MATHER, J., "Improvements in the manufacture or production of gas for illuminating or heating purposes, and for actuating gas-engines." Feb. 20, 1875.

660.—BATES, G., "Improvements in apparatus for attaching main-cocks, valves, plugs, or other connections, to service-pipes for water when under pressure." Feb. 23, 1875.

668.—NEUHAUS, M., "Improved means and appliances for the production of lighting and heating gas from air and spirituous vapour combined." Feb. 23, 1875.

696.—QUICK, J., jun., and RESTLER, J. W., "Improvements in meters for measuring liquids." Feb. 25, 1875.

715.—TROTMAN, S., "Improvements in the mode and means of generating and inflaming gaseous vapour in lamps or other apparatus containing petroleum spirit or other hydrocarbon fluid or highly volatile oils." Feb. 26, 1875.

724.—REYNOLDS, O., "Improvements in apparatus for obtaining motive power from fluids, and also for raising or forcing fluids." Feb. 27, 1875.

741.—DICKSON, J. F., "Improvements in air and gas engines or motors." March 1, 1875.

761.—LAKE, W. R., "Improvements in apparatus for regulating the flow of gas, steam, or air." March 2, 1875.

770.—CLARK, A. M., "Improvements in gas-meters." March 2, 1875.

786.—SUGG, W. T., "Improvements in lamp-burners." March 3, 1875.

797.—ELBOROUGH, C. M., "An improved meter for liquids." March 4, 1875.

812.—CLARK, A. M., "Improvements in pumps." March 4, 1875.

826.—JOHNSON, J. H., "Improvements in traps or apparatus for separating liquids from vapours or gaseous fluids." March 5, 1875.

833.—FARNSWORTH, S., "Improvements in valve apparatus for controlling the passage of water or other fluids." March 6, 1875.

839.—COOKE, J., "Improvements in the construction of rotary engines and pumps." March 6, 1875.

902.—CAREY, R., and PORTER, R., "Improvements in valves for regulating the flow or discharge of gas, water, and other fluids." March 11, 1875.

#### PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

426.—POCOCK, A. W., "Improvements in liquid-meters." Feb. 17, 1871.

443.—EVELEIGH, G., "Improvements in the manufacture and purification of gas, and in certain parts of the apparatus employed therein." Feb. 21, 1871.

469.—TELLING, W. A., and JOHNSON, S., "Improvements in the construction of dry gas-meters." Feb. 22, 1871.

474.—HEYWORTH, R., "Improvements in apparatus for supplying water to wash-basins, and for flushing waterclosets and urinals." Feb. 23, 1871.

543.—COMMON, A. A., "A new or improved automatic apparatus for opening and closing cocks, taps, or valves." March 1, 1871.

556.—BANNEHR, J., and MATTHEWS, H., "Improvements in treating coal for the manufacture of gas and fuel therefrom." March 2, 1871.

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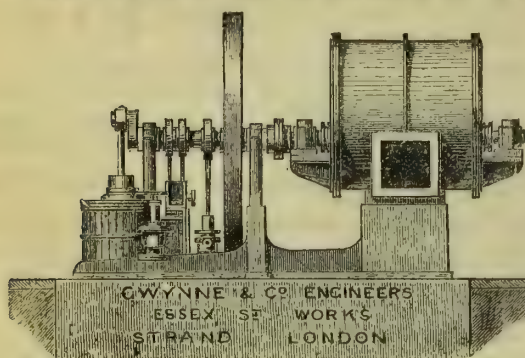
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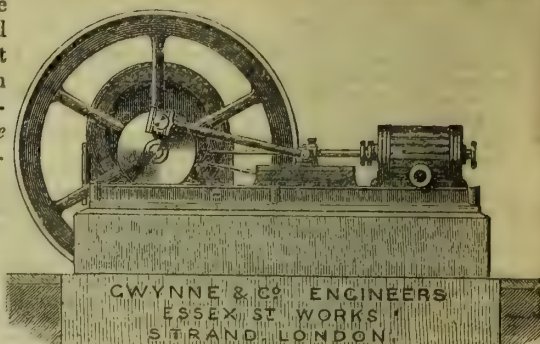
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TO CORRESPONDENTS.

W. R., Shotley Bridge.—We refer you to the report of the Paris Gas Company for 1876, which appeared in the JOURNAL, Vol. XXIX., page 670. A translation of the report for 1877 will be given as soon as it comes to hand.

J. R., Edinburgh.—For your letter and its valuable suggestions we shall find space next week.

THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 2, 1878.

Circular to Gas Companies.

THE shares of the Metropolitan Gas Companies have again recently undergone some fluctuations in value. The fall was not considerable, and prices soon rose once more to nearly previous rates. In seeking for an explanation of these variations in value, we can only—excluding the idea of speculative sales and purchases, which would be absurd in the case of shares, the dividends on which are invariable—ascribe the temporary fall to the reports of extended applications of the electric light. These are greedily caught up and circulated by the general press, who, for some reason, inconceivable to us, seem to take an especial pleasure in endeavouring to depreciate the value of gas property. With the exception of possessing a certain sort of monopoly, which is conferred for the public advantage, a gas undertaking is as purely commercial as any other manufacturing concern. Why, then, such enterprises should be deemed marks for obloquy is more than we can understand. But to return to the electric light. We are almost tired of reiterating an opinion, that there is

nothing in its present state of development, or anything promising in the future, to make it a dangerous competitor with gas. We may even express a wish to see it applied to the illumination of certain public places in the Metropolis; but still its most complete success in these positions would not convince us that gas proprietors have anything to fear. Notwithstanding the advantages claimed for this mode of illumination, we observe a lack of enterprise on the part of the promoters, which seems to us to indicate a want of confidence in its performances. We hope, in our next issue, to give a report by some French experts, who have gone more closely than before into the relative cost of the two modes of illumination. The results would appear to be by no means favourable to the electric light, the cost of which, for really effective illumination, considerably exceeds that produced by means of gas. We may once more express a hope that gas shareholders will not be beguiled by rumours such as we now notice. They possess one of the soundest investments to be found in this country, the security of which increases year by year. We have, of course, before us the lecture recently delivered at the Society of Arts; but there is nothing in that to induce us to believe that electricity will supersede gas for domestic lighting. M. Jablochhoff's candle appears, for the moment, to be extinguished. It will, no doubt, in time, be relighted, with what results we shall not pretend to predict.

We have now before us the report of the Directors of the Surrey Consumers Gas Company, issued in anticipation of the half-yearly general meeting, appointed for yesterday. In our next we shall, of course, give an account of the proceedings at the meeting. To-day we need only mention that the accounts show that the profits made by the Company during the past half year admit of the payment of maximum dividends, leaving a balance of £2162 to be carried forward to the next account. We notice, with satisfaction, that the Directors have invested the sum of £10,000 to constitute a reserve-fund. The state of the capital account of this Company seems to indicate that they will be the next Metropolitan Gas Company who will go to Parliament for further powers, and will, consequently, be brought under modern legislation. The fight in their case will necessarily be over the initial or standard price, and they will probably not be able to secure more than 3s. 9d. per thousand cubic feet. Under present conditions, they may do very fairly with this price; but the Directors may as well be looking out to see what possible combinations can be entered into, to secure a standard dividend in the future. There is in South London a field for amalgamation, which may be worked to the advantage of all parties, failing the general combination which we so earnestly desire to see completed.

The price paid to supply public lamps in the City of London is not objected to in the annual report of Col. Haywood to the Commissioners of Sewers, just issued. Speaking from observation, we may say that the lighting of the City thoroughfares compares favourably with that of any other district in the Metropolis, and we are not surprised that no dissatisfaction is expressed.

The Corporation of Derby are feeling their way towards the acquisition of the undertaking of the Derby Gas Company. If the tide of popular opinion continues to set in the present direction, it seems probable that in the course of a year or two the transfer will be made. The undertaking is a very valuable one, and will necessarily command a high price.

We mentioned last week that the Dublin and Alliance Consumers Gas Company are about to pay maximum dividends, and we may add to-day that, after doing so, they are able to carry forward the sum of £15,264, which the Directors wisely propose to devote to the formation of a reserve-fund. It would be a moot point whether, in the case of a Company in circumstances like the Alliance, an excess of profit might not be applied to the payment of back dividends, seeing that the Shareholders went without any for a year and a half. In our opinion, however, the course taken by the Directors is the best that could have been adopted. It is better to make a full dividend secure, and to wait for the good time coming, which, we hope, will enable the Directors to make up all arrears. The price of coke in Dublin, as everywhere else, seems to have been lamentably low, and this, of course, has told against the Company. Any further reduction in the price of gas at the present time would appear to be impossible; but seeing the reduction in working expenses, and the increase in the sale of gas per ton of coal, such a reduction may be looked for at no distant date. One thing strikes us here which may as well be mentioned. Gas Companies have but little interest in wars, or rumours of wars; but, in reality, they seriously affect their profits. War sends up freights, which adds to the cost of coal. Gas Companies will not fail to be affected by this, if present political complications endure.



The Directors of the Plymouth Gas Company we do not suppose have overlooked this matter, but they have announced a reduction of threepence per thousand feet from and after the reading of the meters for the past quarter. Their price will then be only 2s. 3d. per thousand cubic feet.

The Leamington Gas Company have also announced a reduction of threepence per thousand feet. The Company seem to have had a fair half year's working, and pay good dividends.

The Newry Gas Company are reported to have sold their undertaking to a syndicate of the inhabitants, whatever that may mean, for the sum of £28,500. We are not in love with syndicates, such as are known in the City of London; but the idea of selling a Gas Company to a syndicate of the inhabitants of the district supplied is a novel one, and there may be something in it.

Great complaints are made in Kelso of the stench caused by the escape of gas from the street-mains, and the Police Commissioners desired to have them overhauled. We are sorry to say that the Gas Company are reported to have given no assistance. Some of the mains are said to be greatly corroded, and it would certainly be to the interest of the Company to have the leakages discovered and stopped. According to the report noticed below, the unaccounted-for gas only amounts to twelve per cent., which is not excessive.

We are reminded here that the West of Scotland Association of Gas Managers have recently issued their valuable Annual Report. It is to be wished that the British Association could see their way to the production of a similar document, which would possess great interest and value.

The Summer Instructions of the Metropolitan Gas Referees have just been issued. They make the usual alterations in the maximum amounts of sulphur allowed for the season of smallest consumption. At the Beckton, Bow, and Bromley works of The Gaslight and Coke Company, the sulphur impurity is restricted to fifteen grains per hundred cubic feet, while at all the other works under the supervision of the Referees the allowance is fixed at twenty grains.

The Bill of the York United Gas Company has been read the third time in the House of Lords. Opposition from all quarters having been withdrawn, it will be plain sailing for the Company in the Commons.

A deputation from the Worcester Town Council have had a conference with the Directors of the Worcester Gas Company, but no arrangement has been come to for the purchase of the works by the Corporation.

### Water and Sanitary Notes.

THE report of Colonel Haywood on the sanitary work done in the City of London during the past year, is an extremely satisfactory document. We see with pleasure the continual solicitude of the Commissioners of Sewers, backed by the energetic assistance of their able officers, to keep that small portion of the Metropolis which, unfortunately, only comes within their purview, in the most healthy condition possible. We read that in the hot months of the year—viz., from July to October—the courts and alleys are twice a week rinsed out with jet and hose, and that a solution of carbolic acid is sprinkled, in addition to the daily sweeping. We have no faith in the disinfecting qualities of carbolic acid, and we simply advocate its use because the smell of it somewhat resembles that proceeding from gas-works, and perhaps, on the whole, not so pleasant. The adoption of the hydrant system in the City proceeds apace, and, whatever may be alleged, by Messrs. Bazalgette, Bramwell, and Easton, against those now fixed, we contend that the experiments made by the Water Committee of the City of London have conclusively demonstrated their value. We witness with pleasure the gradual extension of these hydrants all over the main thoroughfares of the City of London, confident that they will be productive of the happiest results. Certain as we feel that three out of every four fires are incendiary, the moral effect of hydrants will be no less great than their physical value when a really accidental fire occurs. It will be worth no ruffian's while to set fire to a building, if he knows that such fire will most likely be promptly extinguished.

The cleansing of the streets in the City, with its unfortunately multitudinous forms of pavements, is a very serious question. Wood or asphalt, to be safe to horses, must be either dry or thoroughly wet, and arrangements must be made to keep it in one or the other condition. We look with much pleasure on the tentative measures taken by the Commissioners of Sewers, and hope that, under guidance, they will, in the course of the next few years, be enabled to select one uniform system of pavement for the whole of the City. We have before pointed out that

granite, wood, and asphalt are hardly compatible with each other. The greasy detritus from the first is responsible for most of the accidents which occur on the two latter, and we recommend the Commissioners to concentrate their observations, with a view, as we have said, to one uniform system of paving in the City.

It is with great pleasure we mention that the Corporation of Manchester have secured possession of Thirlmere Lake. The puerile sentimental opposition brought against the magnificent scheme of the Corporation failed, as we predicted it would, in the face of the evidence of Mr. Bateman, who showed conclusively that the Lake would be enhanced in beauty by the projected alterations in its size and contour. In the course of a few years, the Thirlmere of to-day will be a matter of history, and tourists who will thread their way along a well-made road, following a line of shore, will dwell with admiring eyes on the increased expanse of water with its noble surroundings. The more serious opposition—that of millowners and others who wanted compensation water—was easily dealt with, for Manchester could afford to give any quantity they could reasonably need. The only other point which remained for discussion was one to which we have frequently alluded in the course of our remarks on the scheme, and that is the right of towns lying on the route of the aqueduct, from Thirlmere to Manchester, to participate in the new supply. This has been insisted on by the Committee, and conceded; and Oldham and other towns will share with Manchester the benefit of the bountiful supply of excellent water which will be drawn from the picturesque Lake. We regard the precedent as of much importance. Next year Liverpool must go for some new source of supply; and, probably, the example set by Manchester will revive in the minds of Liverpool men the Windermere scheme, often considered and postponed, but never definitively abandoned. Taking for their guidance the Act about to be settled to confirm the Manchester scheme, the Water Committee of Liverpool and their able Engineers can easily devise a plan which will secure to Liverpool an unlimited supply of water, and confer blessings upon the towns and districts between Windermere and their city.

On the *agenda* paper for the last meeting of the Metropolitan Board there was a notice of a motion by Mr. Runtz, who proposed to move—"That the Bill now before Parliament, to empower the Board to provide a new supply of water for drinking and fire-extinguishing purposes, be withdrawn." After an appeal, almost *ad misericordiam*, from the Chairman, the motion was withdrawn, on the assurance that no further expense should be incurred in prosecuting scientific and other inquiries, with a view of supporting the measure, should it come before a Committee in the House of Commons. What the Board have been doing we are not explicitly told, but it would seem that a large expenditure was in progress against which careful ratepayers feel bound to protest. There is now no probability that the Bill can be proceeded with in the present session, and, since its success is doubtful in any coming session, the waste of public money may as well be stopped at once. We are sorry for Sir J. M. Hogg's position, who, no doubt, does the best he can for *exigant* constituents; but the pockets of the Metropolitan ratepayers must be protected.

In the meanwhile, the parishes continue to protest. The Vestry of St. Pancras, who have resolutely opposed the Supply Bill, have now drawn up a strong protest against the second reading of the Purchase Bill, which will be found in another column. The two Bills are, in a certain sense, bound up together; but while regarding the Supply Bill as utterly hopeless, there might be something said in favour of the Purchase Bill. Mr. Runtz should have moved that both Bills be withdrawn, for no doubt a large expenditure is being incurred in the promotion of the Purchase Bill, which has not the smallest chance of success. Lambeth also protests in very emphatic language. The Government will now have before them what Mr. Slater-Booth asked for—viz., an expression of opinion on the part of Metropolitan Ratepayers. Although the whole of the Vestries and District Boards have not taken an equally active share in opposition, we think it may be taken as a fact, that every one is against the new Supply Bill, and that a considerable majority are opposed to the Purchase Bill. They think that both alike are unnecessary, and, for the most part, regard the Metropolitan Board of Works, as at present constituted, as unfit to have the control of the Water Supply. The ratepayers, therefore, for the present, sensibly resolve to bear the ills they have, rather than fly to those they know not of.

The Society of Arts, following up the suggestion contained in the letter of H.R.H. the Prince of Wales, which we published a few weeks ago, propose to hold a conference in May, to consider the question of our National Water Supply. In the meantime, they invite communications from all who have any notions to



offer. We rather shudder to think of the quantity of print we shall presently have to wade through, and the flood of talk we shall, perhaps, have to listen to; but, with other ills, both must be endured. Our great fear is that Mr. Edwin Chadwick, C.B., may feel inspired to make a long speech at the projected conference.

Our "Parliamentary Intelligence" will inform our readers that the Bill, to confer extended powers on the Nottingham Water-Works Company, has been approved by the Select Committee of the House of Commons, with some reduction in the amount of share and loan capital, and the insertion of Auction Clauses. The preamble of the Nottingham Corporation Gas, Water, and Improvement Bill has been passed by the same Committee, all reference to the purchase of the Water Company having been struck out. Thus, we are happy to say, a large and important water undertaking has been saved from the clutches of a Municipality. The rapid disappearance of commercial undertakings, like this Company, could not be regarded as an unmixed good to the community, and the day, we think, will assuredly come when some of the purchases made within the last few years will be regretted. In the meantime, the infection spreads, and to-day we find the Corporation of Derby hankering after the well-managed undertaking of the Derby Water-Works Company. No direct negotiations have, we believe, yet been opened, but the Corporation are anxious to know on what terms the Company will sell.

**LIVERPOOL WATER SUPPLY.**—At the meeting of the Liverpool Water Committee on the 18th ult., the Engineer presented his annual report on the state of the water-works of the Corporation. With regard to the wells, he reported that during the past year, on account of the unprecedented rainfall, all the engines had been stopped for considerable periods. The total supply during the year from the wells was 1,439,157,622 gallons, the average per day being 3,953,729 gallons. The distribution of water during the year had been, without exception, constant. The average supply per head per day for all purposes was 22·83 gallons. This included 4·74 gallons per head per day charged by meter for trade purposes, and about 3 gallons per head per day for public purposes and for trade purposes charged by assessment, leaving 15 gallons per head per day as the consumption for domestic purposes, hotels, public-houses, warehouses, offices, and shops. Referring to the supply of water to Chorley, the Engineer states that the population of this town, to which water is supplied from Rivington, is 18,300. Until the introduction of the waste-water meter system in 1877, the supply of water to Chorley was between 15 and 16 gallons per head per day for all purposes, and about 13 gallons excluding those trades to which water is supplied by meter. The waste had recently been so checked by methods similar to those adopted in Liverpool that the supply for all purposes had fallen to 10·47 gallons, and, excluding the meter supplies, to 6·88 gallons per head per day.

**DARTMOUTH GAS COMPANY.**—The twentieth ordinary general meeting was held on the 19th ult.—Mr. W. H. Rees in the chair. The Secretary (Mr. Crawford) read the report, which stated that the reduction made in the price of gas in April last had necessarily affected the gas-rental, and, together with increased expenditure under several heads, left but a small balance available for dividend. Extensions had been made during the past year at Warfleet and also at Sandquay, where additional public lamps had been fixed. A new set of retorts had been erected in lieu of ovens, and it was proposed to gradually replace ovens, as they became worn out, by retorts. In consequence of the difficulty experienced in meeting the public demand for gas, in December last, the Directors thought it advisable to seek the advice of a gas engineer, as to the general condition of the Company's works. The report of Mr. Dand on this subject would be submitted at the meeting, and its recommendations taken into consideration. The Directors regretted to find that, notwithstanding upwards of 500,000 feet of gas were manufactured in 1877 in excess of the previous year, the amount received for gas-rental had fallen off in a larger proportion than the reduction in price would justify. This they had reason to believe arose from leakage in the mains and services, many of which required renewal, and some considerable expenditure would require to be made under this head during the coming summer. The necessity of an increase in the working capital of the Company had become apparent. The Directors invited the opinion of the Shareholders on the subject, as to whether this should be done by a call, by issue of new shares, or by debenture bonds. The total receipts for the year amounted to £1802 1s. 8d., and the total payments to £1625 7s. 10d., leaving a balance of £176 13s. 10d. The Directors recommended a dividend of 6s. per share, free of income-tax, to meet which the sum of £33 6s. 2d. would have to be withdrawn from the reserve and depreciation fund of 1876. The Chairman, in moving the adoption of the report, stated that the Directors, at their meeting on the previous day, resolved that the capital should be increased by the issue of debenture bonds. Mr. Hurrell having seconded the motion, Mr. Egg took exception to several parts of the report, more especially that relating to the smallness of dividend. He complained of the general management during the past year, and compared the expenses and assets with those of former years. The Chairman said he was prepared to prove that the year just passed had been a most exceptional one. The difficulty the Directors had experienced in supplying the demand had decreased the assets, and not only so, but their payments in 1877, as compared with those of 1876, had increased £289. This had been caused by the erection of new retorts, &c. But after various other deductions there was a purely exceptional expenditure of £281 5s. This sum, added to the actual profit for the year, amounted to the sum of £457, which would have been sufficient to have paid a dividend of 12s. per share, leaving a balance of £37 to the reserve-fund; and in addition to this, the reduction of 5d. per 1000 in gas, amounting to £68 to the three quarters consumption, and the extra discount of 5 per cent. to the large consumers, involved a further loss of £4. This sum of £72 would have given, in addition to the above-mentioned dividend, 1½ per cent. extra on the whole of the capital. Much of this outlay would not be required again, and he felt assured that the Company's prospects were in as healthy a state as ever. The report having been adopted, the dividends recommended therein were declared, the vacancies by retirement at the Board and the auditorship were filled up, and the proceedings closed with thanks to the Board, the Secretary, the Manager (Mr. G. E. Ohren), and the other officers of the Company.

## A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLXII.

PUBLIC LIGHTING (continued).

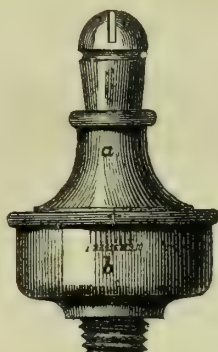


FIG. 36.

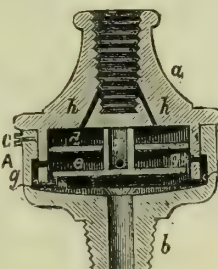


FIG. 37.

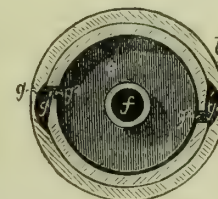


FIG. 38.

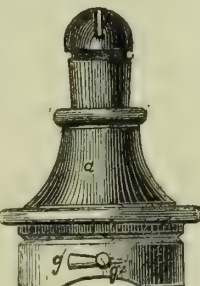


FIG. 39.

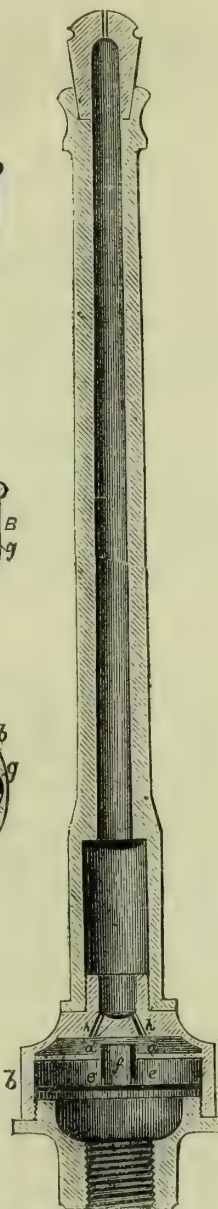


FIG. 40.

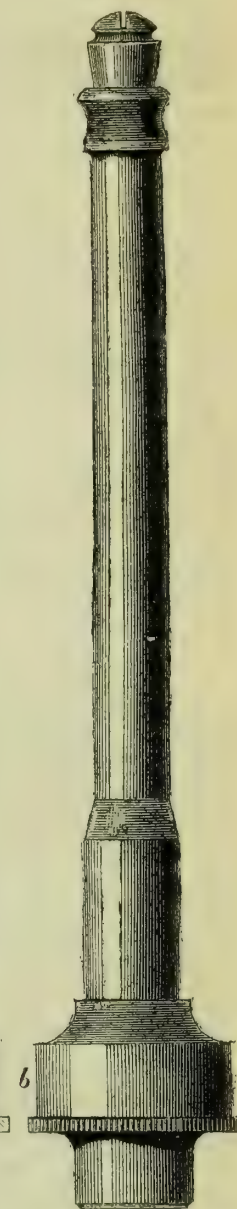


FIG. 41.

In the accompanying figs. 36 to 41, the dry metallic governor patented by Mr. T. S. Borradaile is represented full size. This is a remarkably simple and ingenious apparatus, and its dimensions are such that it offers no obstruction to the light, and consequently casts no downward shadow.

This governor or regulator may be adapted both to a variable and fixed consumption of gas in street-lamps. The arrangement for a variable consumption is shown in fig. 36 in elevation, and in figs. 37 and 38, as sectional elevation, and plan through A B. It consists of a cup, *b*, screwed into the gas-pipe. A hollow cylinder, *a*, surmounted by the burner, fits into the cup. The variation in the quantity of gas consumed is regulated, without taking the apparatus to pieces, by means of a scale marked on the outside of the cup, fig. 36, with a corresponding mark on the rim of the hollow cylinder, and once the latter is placed in its proper position, it may be fixed by means of a screw, *c*, fig. 37. The cylinder is shown separately in elevation in fig. 39.

The passage of the gas from the pipe to the burner is by way of the grooves, *g*, in the sides of the cup, and the orifices, *g¹ g²*, in the sides of the cylinder; and by turning the latter within the cup the capacity of the passage, and hence the consumption of gas, is either increased or diminished.

Within the cylinder, *b*, is a fixed metallic diaphragm, *d*, having a round hole in the centre, in which a short tube, *f*, works up and down, being actuated by the gas pressure upon a disc, *e*, which this tube surmounts. In the sides of the tube are holes through which the gas flows to the burner by way of the passages in the top of the hollow cylinder, *a*. The greater the pressure of gas in the main or service-pipe, the more the disc, *e*, is raised, and the narrower consequently becomes the gas passage between the edge of the tube, *f*, and the top of the cylinder.

For the regulation of a fixed consumption of gas in street-lamps, the cup and hollow cylinder arrangement is discarded, and the



cylinder, *a*, is screwed directly upon a base fixed on the lamp stand-pipe, as shown in figs. 40 and 41, in longitudinal section and elevation respectively.

The action is very simple; the disc, *e*, is adjusted so that at a low pressure, say 6-10ths, the required quantity of gas can pass through the small hole. As the pressure increases, the moveable disc is raised, bringing the small tube in nearer contact with the roof of the chamber, and thereby checking what would otherwise be an increased consumption.

The workmanship and adjustment of the apparatus are of great accuracy. If these indispensable points of construction are carefully observed, the governing action cannot be otherwise than satisfactory, whilst the instrument can scarcely suffer derangement with ordinary use, owing to the material of which it is made, and the absence of complication in the working parts.

(To be continued.)

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### REVIVIFICATION OF LIME.

SIR,—I, in common, I believe, with many other country Managers, was deeply interested in a recent article which appeared in the JOURNAL on the above subject, and which treated upon an improved process by Mr. Hislop.

Seeing that "foul lime" is the greatest enemy we have to deal with in gas-works, we must hail with pleasure any process by which the nuisance may be alleviated or removed. I should, therefore, much like more light to be thrown on the subject, and for information to be published through the JOURNAL, so that we Managers may, if possible, apply it to the various gas-works of the country.

May I ask, Will it pay in works where the make reaches from 12 to 25 millions per annum? and could not the spent heat from the retort-beds be utilized to do the work?

Mold, March 20, 1878.

E. OWEN.

### ANNUAL ACCOUNTS OF GAS COMPANIES.

SIR,—With your permission, I will reply to Mr. Russell, and other inquirers on this subject, that the Act of 1847 orders that the accounts shall be sent to the Clerk of the Peace for the county in which the gas-works are situate, before the 31st of January in each year; but the accounts so to be sent are for the year preceding, thus giving thirteen months to prepare the accounts.

The Act of 1871 does not vary these conditions as to the Clerk of the Peace, but, in addition, requires that the accounts shall be sent to the Local Authorities; here, however, they only give three months to prepare the accounts—viz., "on or before the 25th day of March in each year, an annual statement of accounts made up to the 31st day of December then next preceding," the word *next* making the difference between three and thirteen months. But all Companies have their accounts out by the 25th of March, and audited, even though they may not have been submitted to the proprietors, so there need be no difficulty in the matter.

Lower Sydenham, S.E., March 27, 1878.

MAGNUS OHREN.

### HYDRAULIC LIFTS FOR PURIFIER COVERS.

SIR,—A paragraph which appeared in your last issue states that certain improved hydraulic apparatus, for lifting and lowering the 16 purifier covers, 30 feet square, now being erected at Beckton, is from the designs of Mr. J. Coates. These purifiers are merely an extension of the same ideas which I worked out in detail some seven years ago in consultation with Mr. Evans, then Chief Engineer to the Company. The new purifiers are square, and the original ones are round, but the latter are of a bolder type, being 41 feet 6 inches in diameter.

V. WYATT.

The Gaslight and Coke Company, Beckton, North Woolwich,  
March 29, 1878.

### GAS PROPERTY, GAS ENGINEERS, AND THE YORK GAS COMPANY.

SIR,—As I feel perfectly sure that all your readers who can understand anything, will thoroughly understand my criticism of last week upon your correspondent Mr. Henry Woodall's report to the York Corporation upon the York Gas Company's Bill; and as I feel equally sure they will, one and all, fully appreciate Mr. Woodall's reply in your last JOURNAL, I will not ask you to prolong the discussion; and, if I am not mistaken in the general intelligence of Gas Engineers, I flatter myself that such a discussion would be altogether out of the professional lines.

There are one or two statements, however, in Mr. Woodall's letter which, in justice to my own self-respect, demand a passing remark. Mr. Woodall believes that my first letter was circulated, in a separate form, with the object of bringing "discredit" on his "professional sincerity." Now, I regard this as a reflection upon myself, and unworthy of fair criticism. Mr. Woodall's report affected large interests, and was essentially public property; and, therefore, he must not find fault if "A Gas Shareholder" takes note of what he calls his "revolutionary ideas." If those ideas will not bear examination, without bringing "discredit" upon his judgment, it surely is his fault, and not mine, and imputing motives will not help the matter one jot. The other statement in Mr. Woodall's reply which reflects upon my integrity, and which I cannot allow to pass, is this. He says: "I quite agree with 'A Gas Shareholder,' that where the rate of interest on capital employed in gas enterprise is but 5 per cent., or even less, there is little inducement to reckless expenditure; and I distinctly stated this fact in my report, though your correspondent has not had the candour to admit it." I say most emphatically that, neither "distinctly" nor otherwise, does this statement appear in Mr. Woodall's report, as printed in any of the York newspapers, and, therefore, it is unfair of Mr. Woodall to

impute dishonesty to me, for that is the plain English of want of "candour" in such a case. If I am not correct in this, I challenge contradiction.

The rest of Mr. Woodall's letter I shall pass over; for with "Burslem" perpetually in the foreground, as the pivot upon which all gas data must turn, I cannot follow him.

York, March 29, 1878.

A GAS SHAREHOLDER.

### BIRMINGHAM CORPORATION GAS ACCOUNTS.

SIR,—The Comparative Statement issued by the Gas Department of the Birmingham Corporation, which appeared in last JOURNAL, showing the expenditure and receipts under the former management of the Companies and the present management of the Corporation, does, I conceive, an injustice to the former, and, indeed, to Gas Companies generally. Had it stated that the Corporation are now charging the Consumers at Birmingham about £60,000 per annum more than the Companies, as seen by the rates below, there would have been no ground for observation. The discount allowed to Consumers in 1873, by the Companies, for prompt payment, was the same as that allowed by the Corporation in 1877.

VINDEX.

	Birmingham—Charges for Gas.			
	Over 100,000 Feet.	Under 100,000 Feet.	Under 25,000 Feet.	Under 10,000 Feet.
Companies charges, June, 1873 . . .	2s. 3d. . .	2s. 5d. . .	2s. 7d. . .	—
Corporation charges in 1877 . . . .	2s. 9d. . .	2s. 11d. . .	3s. 1d. . .	3s. 3d.

### EXETER GAS BILL.

SIR,—On reading the editorial remarks which appeared in your last two "Circulars" in reference to this matter, the familiar saying, "Give a dog an ill name, hang him," occurred to my mind; and I beg you will permit me to say, and publish my saying, that I cannot see why you should so readily receive from unreliable sources, and publish editorially, statements which are devoid of truth, and calculated not only to mislead, but to inflict serious injury upon the unoffending Shareholders of a Gas Company.

I beg to inform you that the Exeter Town Council have made an approach to the Gas Company, and offered terms which can only be characterized as ridiculous; and that the Company have made no attempt to sell the property, and have simply declined to entertain the offer, having no other intention than to prosecute the even tenor of their way in Parliament, prosecutions and persecution notwithstanding, and thus the "Battle of Exeter" will be fought out.

R. P. SPICE.

21, Parliament Street, Westminster, S.W.,

April 1, 1878.

[Our remarks were based on the reported proceedings of the Exeter Town Council in three of the city papers, and if there be any untruth in the statement we are not responsible for it. If the undertaking remain in possession of the Company, no one will be more pleased than ourselves.—ED. J. G. L.]

WALSALL SEWERAGE.—At a special meeting of the Town Council of Walsall, on Wednesday last, a letter was read from the Local Government Board with respect to the Provisional Order applied for by the Council in reference to the lands required for sewage-works. The letter stated that "the Board learn from Colonel Cox that the subsoil of the land proposed to be acquired is not well adapted for purifying the sewage, but it appears that there is no land in the neighbourhood of a more suitable character than the site selected, and that it is intended that the sewage shall, so far as possible, be clarified in tanks before it is applied to the land now sought to be obtained. The Board consider it may be open to question whether the scheme of the Town Council will sufficiently purify the sewage, before its discharge into the river, to comply with the requirements of the Rivers Pollution Prevention Act, 1876; but, having regard to all the circumstances of the case, they have determined not to refuse the issue of the Provisional Order applied for by the Town Council. At the same time, it must be understood that, if the requirements of the Rivers Pollution Prevention Act are not satisfied, the Town Council will have to provide more effectual means for the purification of the sewage."

BURNLEY CORPORATION GAS SUPPLY.—Colonel Cox, a Local Government Board Inspector, held an inquiry at Burnley, on the 27th ult., in consequence of an application from the Town Council to amend, by Provisional Order, the Local Act, so as to extend the borrowing powers conferred by the Improvement Act, 1871, to enable them to borrow, in addition to all moneys that they are entitled to borrow under their Act, the sum of £35,000 for gas purposes, and £25,000 for sewerage purposes. The Town Clerk, in stating the case in respect to the gas-works, said the gross estimated outlay for the next seven years was £38,040. The Gas Engineer had gone more minutely into the matter since, and entered into details, and now put it down at £37,717. After applying the proper sinking-fund, the powers of the Corporation were exhausted. The Inspector: The fact is that you have raised £20,000, you have expended it on works, and that, owing to the increase of the borough and the prospective increase, you require to extend the works. The Town Clerk stated that they required new retorts, new gasholders and tanks, extension of mains, &c. The Inspector: How much do you intend to spend in the next twelve months? The Town Clerk: Within the next twelve months the estimate is for £9000. I am afraid one portion will not be completed this year, but it can be started. We shall not be able to complete the new gasholder and tank. In answer to a question by the Inspector, the Gas Engineer (Mr. Leather) said the works in connection with the gasholder and extension of mains ought to be done during the current year, if possible; the retorts must be. Their present gasholder capacity was 994,000 feet, which was barely 24 hours consumption. One day during last year they used about 1,200,000 feet in the 24 hours; the capacity was for 994,000 feet, so they had not 24 hours stock. The Town Clerk: If there had been a full demand last winter, they could not have met it. The Inspector said it was very wasteful going on from hand to mouth in that way. Mr. Leather said it was a great loss. They ought to have storage for a day and a half's supply. On the Sunday there was very little consumption, and if they had no storage they had to stop the retorts, and it entailed more retorts and more fires to work during the whole week. The Town Clerk said the figures had been a little modified, and reduced from £38,040 to £37,717. Mr. Leather said it would be more economical to put down two tanks at once than separately, which would add a little more to the first year's cost, making it about £12,124. The Town Clerk said the Engineer's report showed that it was proposed to put down another gasholder, after the one this year, within the next six years. The inquiry was then closed.



## Parliamentary Intelligence.

## HOUSE OF LORDS.

MONDAY, MARCH 25.

The Examiners reported that the further Standing Orders applicable to the Sevenoaks Water Bill have been complied with; and that no further Standing Orders are applicable to the Bangor Local Board Bill.

Bill brought from the Commons, read the first time, and referred to the Examiners:—Marske and Saltburn Gas.

Bill read a second time, and committed:—Hartlepool Gas and Water.

The Castleford Local Board, Castleford and Whitwood Gas, and Normanton Gas Bills were referred to a Select Committee, consisting of Lord Strathford (Chairman), Earl Rosslyn, Earl Amherst, Viscount Hood, and Lord Ribblesdale; to meet on Friday, March 29.

TUESDAY, MARCH 26.

The following report from the Standing Orders Committee was agreed to:—"That the Standing Orders not complied with in respect of the petition for additional provision in the Leicester Corporation Bill ought to be dispensed with, and that the petitioners should have leave to insert the additional provision if the Committee on the Bill shall think fit."

The Examiners reported that no further Standing Orders are applicable to the Southport Water Bill.

Bill brought from the Commons, read the first time, and referred to the Examiners:—Farnworth and Kearsley Gas.

Bill read a second time, and committed:—Brading Harbour District Gas. A petition in favour of the petition for additional provision in the Leicester Corporation Bill was presented from Select Vestry of the Parish of St. Margaret, Leicester, &c.

THURSDAY, MARCH 28.

The Chairman of Committees informed the House that the Promoters do not intend to proceed further with the Castleford Local Board Bill during the present session.

Bills reported, with amendments:—Burton-upon-Trent Commissioners; Exeter Corporation Water; York United Gas.

Petitions were presented against the Bangor Local Board Bill, from Bangor Water and Gas Company; and against the Southport Water Bill, from (1) Corporation of Southport, (2) Owners, &c., of property within the proposed limits.

FRIDAY, MARCH 29.

Bill reported from the Select Committee, with amendments:—Castleford and Whitwood Gas.

Bills reported, without amendment:—Brading Harbour District Gas; Hartlepool Gas and Water.

The Examiners reported that the further Standing Orders applicable to the Marske and Saltburn Gas Bill have been complied with.

Bills read a second time, and committed:—Bangor Local Board; Sevenoaks Water.

Bills brought from the Commons, read the first time, and referred to the Examiners:—Durham Water; Torquay Gas.

The Newry Gas and Warrington Water Bills were referred to a Select Committee, consisting of Viscount Sidmouth (Chairman), Earl Saint Germans, Lord Dorchester, Lord Hatherton, and Lord Acton; to meet on Tuesday, April 2.

## HOUSE OF COMMONS.

MONDAY, MARCH 25.

Bill, as amended, considered, and ordered for third reading:—Durham Water.

Bills read a second time, and committed:—Dublin Corporation Water-Works Acts Amendment (Lords); Truro Water.

The Examiners reported that no Standing Orders not previously inquired into are applicable to the Bedlington Local Board Water and Batley Corporation Water Bills (Lords).

Bill reported:—Dalton-in-Furness Local Board.

Lords Bill read the first time, and referred to the Examiners:—Forfar Water.

A petition against the Metropolis Water-Works (Purchase) Bill was presented from Hackney; and one against the Metropolis Water Supply Bill, from Inhabitants of St. Pancras, in public meeting assembled.

TUESDAY, MARCH 26.

Bill read the third time, and passed:—Farnworth and Kearsley Gas.

Bill, as amended, considered, and ordered for third reading:—Torquay Gas.

Bills reported:—Cheltenham Corporation Water; Lewes Gas; Nottingham Improvement, Gas, and Water; Nottingham Water.

The Hamilton Burgh Bill was referred to a Select Committee, consisting of Lord Henry Lennox (Chairman), Mr. Holt, Colonel Beaumont, Mr. O'Byrne, and Sir John Duckworth (Referee); to meet on Tuesday, the 2nd of April.

The Hemel Hempstead District Gas and the Lea Bridge District Gas Bills were referred to a Select Committee, consisting of Mr. Leatham (Chairman), Viscount Holmesdale, Mr. Ralli, Mr. Chester Master, and Mr. A. Bonham-Carter (Referee); to meet on Tuesday, April 2.

WEDNESDAY, MARCH 27.

Bills, as amended, considered, and ordered for third reading:—Scarborough Water; Shrewsbury Gas.

Lords Bill read the first time, and referred to the Examiners:—Clitheroe Gas, Water, and Improvement.

Petitions against the Metropolis Water Bills were presented from Board of Works for St. Giles's District, and Marylebone.

THURSDAY, MARCH 28.

Bill read the third time, and passed:—Durham Water.

A petition in favour of the Metropolis Water-Works (Purchase) Bill was presented from the Vestry of St. Leonard, Shoreditch.

Petitions against the Metropolis Water Supply Bill (the petitioners not praying to be heard) were presented from (1) Inhabitants and Ratepayers of Marylebone, in public meeting assembled, (2) St. Giles's District Board of Works.

The petition was withdrawn of Grand Junction Canal Company against the Hemel Hempstead District Gas Bill.

FRIDAY, MARCH 29.

Lords Bill reported, without amendment:—Deal Water.

Lords Bill reported, with an amendment:—Imperial Continental Gas Association.

Bill read the third time, and passed:—Torquay Gas.

Bills, as amended, considered, and ordered for third reading:—Dalton-in-Furness Local Board; East Grinstead Gas and Water; Scarborough Corporation Water; South Hants Water.

The Examiners reported that no Standing Orders not previously inquired into are applicable to the Exeter Gas and Forfar Water Bills (Lords).

A petition against the Bedlington Local Board Water Bill (Lords) was presented from John Clayton and others.

## HOUSE OF COMMONS COMMITTEES.

TUESDAY, MARCH 5.

Before Sir LAWRENCE PALK, Chairman; the Marquis of LORNE, Mr. STARKEY, and Mr. ERNEST NOEL; Sir JOHN DUCKWORTH, Referee.)

## CHELTENHAM WATER BILL.

## CHELTENHAM CORPORATION WATER BILL.

Sir EDMUND BECKETT, Q.C., Mr. VENABLES, Q.C., Mr. MICHAEL, and Mr. BAZALGETTE appeared for the Company; Mr. POPE, Q.C., Mr. BIDDER, Q.C., and Mr. BALFOUR-BROWNE appeared for the Corporation.

Mr. VENABLES, in opening the case for the Company, said that the present Bill was for the purpose of providing an additional and improved supply of water for the town of Cheltenham. The existing Company were established in 1824, and acquired power to supply the town by an Act of that year. There were three different Acts, the last of which was obtained in 1858, for the purpose of enabling the Company to raise additional capital, and, in some instances, to obtain additional supplies of water; but, for reasons which he would afterwards explain, the supply had been found by general consent to be inadequate. It was now necessary to obtain a much larger supply, which the promoters offered to give, and they hoped to satisfy the Committee that it would be more than enough in quantity, and very good in quality. The Cheltenham Corporation Bill also proposed to provide a new supply, and, as a necessary condition or accompaniment of providing that supply, to purchase compulsorily the property of the Cheltenham Water Company. In a popular sense they were competing Bills; but did not resemble the competing Bills of two Railway Companies proposing to make railways, for instance, between the same termini, and the only question in which was, which was the better for the public. In the present case the Company were in possession; and it was their duty, and their right, to supply water to Cheltenham, and no other body could supply it as long as the Company were able and willing to do so, unless Parliament thought fit to grant to the Corporation the very unusual privilege of the compulsory purchase of the Company's works, to which they strongly objected. The Company had deposited a merely formal petition against the Corporation scheme, for this reason, that they only wished to be heard on their petition in the event, which they hoped would not occur, of the Committee not sanctioning the preamble of their Bill. As to the general question as to which was the better supply, it was unnecessary for the Company to petition, because the promotion simultaneously of two competing Bills enabled each party, not only to give evidence in support of its own case, but to inquire minutely into the case of the opposite party; therefore, as competitors, the Company undertook to show to the Committee that the supply proposed by the Corporation was not adequate. The Corporation, by their own admission, could not carry out their own scheme, except on the condition of the compulsory purchase of the Company's works; therefore, their scheme must be supposed to be the scheme of the Company added to their own. What the Company proposed was to get a supply, which would be practically unlimited, from the River Severn, which was some miles from Cheltenham. It would be pumped at Tewkesbury, and brought by mains to Cheltenham. There was the *primâ facie* advantage of an unlimited supply. It was not like the ordinary case of applying for powers to take water from a river, because the Company already possessed that power, and were now supplying the town of Tewkesbury; and the Act which gave them the power to do so enabled them to take 500,000 gallons of water daily from the river, which was more than twice as much as they could want for several years to come, and probably more than they should ever want; so that they had no compensation to give to anybody, and no new water rights to acquire; they had merely to employ, for the benefit of Cheltenham, the property they had already acquired. Cheltenham was situated immediately under the steep western slope of the Cotswolds. The undersoil was of a water-bearing clay of the lias formation, and through the stratum on which the town rested, the water-bearing stratum in some places cropped up to the surface. In other places it was hollowed out in holes or basins of sand mixed with water, and wherever that sand or gravel was found, wells could be sunk and water found, but the colour was not altogether satisfactory; and, of course, as the town became larger, the supply from the wells became less and less desirable, because it was more or less liable to pollution. The supply of the Water Company, authorized under various Acts, the latest of which was passed about 20 years ago, was derived from the high ground in the immediate neighbourhood of Cheltenham, at a place called Hewletts, where there were, under separate Acts, five different reservoirs constructed by the Company. The water was of very good quality—about 9° of hardness—and was derived from the water passing through the oolite, which formed the upper surface of the Cotswolds in that part, and rested on the clay. There was a storage of 34 million gallons, spreading over five different reservoirs; but in a dry year an annual supply could not be afforded from these wells of even as much as 300,000 gallons. The present population of Cheltenham, and certain adjacent places within the Company's district, was 58,000, this being estimated at 30 per cent. on the population of last census. It was perfectly evident that 300,000 gallons per day would be absurdly inadequate for 50,000 of a population. There was a supplementary supply, which was not so good in quality as the proper supply. The supplementary supply was taken from a place called Sandford Mead, in the town of Cheltenham. The Company were empowered by their Act to buy certain land there, and they had sunk wells and erected pumps, by means of which, in a case of need, they could obtain about 200,000 gallons additional, which would be pumped from the reservoirs and mixed with the other water. But it was so far objectionable that, although he did not believe it was bad, it was not so good as the water in the wells, and therefore it was advisable to avoid that supply as far as possible. But, even with that, the dry weather supply could not be taken at even 450,000 gallons. There ought to be, for, say, 60,000 people 20 gallons per head, which would amount to 1,200,000 gallons per day, which ought to be supplied to the present population. But, of course, it was always prudent and customary to provide for an increase of population; and the very smallest increase of population it was thought necessary to provide for was 72,000, including the present population, which would be a very moderate addition to a town like Cheltenham, which depended upon the general prosperity of the country, and was likely to extend. It had special reasons for extending, because there was a new railway in course of construction, called the Cheltenham and Banbury Railway, which, no doubt, in its own neighbourhood, would make an increase in the population; so that it could not be said that the Company were looking too far forward in providing for a population of 72,000, at 20 gallons per head, which would make a total of 1,440,000 gallons per day. At present the supply was considerably less than what it was proper to provide. This did not arise from any negligence on the part of the Company, but really partly from the natural difficulties of the case and partly from opposition, which the Company thought was mis-



taken. The Company were not bound to show the necessity for a larger supply, because that was common to themselves and their opponents, who, along with the Company, admitted it. The only question was where the supply should be taken from, and by whom it should be provided. The water-works were constructed in 1824. In 1852, Cheltenham obtained an Act for its local government under Commissioners; but within the last few years the Commissioners had been superseded by the Corporation. In 1853, as soon as the Commissioners had begun their alterations, one of the first steps which they adopted was to apply to the Company, according to the Public Health Act, for a supply of water for public purposes; but they put it unreasonably high, and required 700,000 gallons a day for that purpose, knowing that this was much in excess of the total supply of the Company. The Company, of course, informed the Commissioners that they had no means of supplying such a quantity; but they took all the measures in their power to supply it, and in 1853 they applied to Parliament for a supply which would be of good quality and sufficient in quantity, from a place called the Syreford Springs, but they were met with the opposition of the landowners interested in the River Colne which took its source from the springs, and ran into the Thames. The opposition was a very powerful one. The landowners objected to the local injury that would be inflicted upon them, and they had the very strong argument in their favour that the Company, being in the watershed of the Severn, were taking the water that belonged to the watershed of the Thames. That objection prevailed, and after a severe contest, the Company were defeated. He mentioned this to show that the Company had admitted that the supply was not sufficient in quantity, and that they had always been anxious to meet the difficulty. After that Bill was thrown out, the Commissioners renewed their application. The second time they applied for 400,000 gallons; but, unfortunately, the Company, though anxious and willing to comply with their demands, could not give them the quantity asked for. In 1854 the Company again attempted, by a negotiation, to obtain the control of these springs; but it was found that some of the landowners asked high terms, and others would not part with their property on any terms whatever. The Company knew, after their defeat in Parliament, especially on that ground which had since been adopted on the highest authority, that towns should be confined to their own watershed, that they could not persist in it; and they consequently did not proceed further. During the same year negotiations were going on between the Company and the Commissioners for the purchase by the Commissioners of the property of the Company. There was no objection whatever to the principle of purchase by agreement, but it was quite another thing when the purchase was by compulsion. The terms, however, could never be arranged. The object of the Company at that time was to throw on the Commissioners the onus, which was found to be very heavy indeed, of procuring an additional supply. The only other spring water that could be obtained was that which the Corporation proposed to impound at the present time. It might be asked, "Why did not the Company take these springs?" The fact that they were anxious to go to a great expense to get more distant springs was pretty good evidence, as far as it went, that they could not supply their wants nearer home. There were two reasons which prevented the Company from adopting these schemes—one was that the whole quantity was utterly insufficient, even if added to the present supply; another was that they knew that Parliament, as a general rule, required compensation to be given in water; and it would have been very expensive and difficult to give compensation; and a proof that it would be so, was that the Corporation did not propose to give compensation in water, and the Company would appear before Parliament in the invidious position—which was now occupied by the Corporation—of evidently doing a great deal of local and public mischief, even if the landowners were satisfied with money. Of course, any right that the landowners had might, in an ordinary case, be bought off with money; but the whole country would be very seriously damaged by the drying up of the streams and springs, and many persons would be damaged whose position in the world was such that they could not be expected to appear before Parliament. There were several landowners who appeared to oppose the Corporation Water Bill. Some of these had been satisfied with money payments, and others, of whose cases he knew nothing, also appeared to oppose. There would have been an indefinite amount of compensation to pay, and, after all, there would not have been enough water to supply the town. That was the reason why the Company had not adopted the scheme, and as their interest coincided with their duty in this matter, there was a strong probability that they had adopted a wise and right course. The notice which the Commissioners had given to the Company to supply water for public purposes remained in force for many years, although they was not able to comply with it. They always did everything they could in the way of laying down mains when they were asked to do so, and otherwise to discharge their public duty; but the Commissioners and the Company equally knew that there was an insufficient supply of water. In 1864 the Company, having fully considered the whole merits of the case, came to the conclusion, which they were still satisfied was the right one, that the only possible, and large, and sufficient supply for Cheltenham must be drawn from the River Severn. At Tewkesbury, where the supply was proposed to be taken, it was nine miles off from Cheltenham. They were in the watershed of the Severn, and the stream of the Severn was so ample that the Company knew, as the result proved, that they should not be opposed in taking an amount large enough to provide for all future wants. In 1864 they introduced a Bill for providing a supply from the Severn. At that time the Commissioners renewed their negotiations with the Company for purchase, and at one time they had come so near to a settlement that the Bill was withdrawn at the request of the Commissioners, that the question of purchase might be left open. Again, however, the purchase came to nothing. The negotiations had not been renewed, and in 1865 the Company re-introduced the Bill for acquiring a supply from the Severn. They were met with opposition from the Commissioners, and also with a competing Bill by another Company, who proposed to take water from a place called South Cerney Springs, which like the Syreford Springs, were in the Thames Valley. That was opposed, and the South Cerney people being a private Company competing with the Water-Works Company, they relied very much on their water being spring water as compared with the river water which the Water-Works Company proposed to take. There was also a violent agitation got up in Cheltenham and placards were issued for the purpose of raising a prejudice against the Severn water. They might have saved themselves the trouble, because they were opposed, not only by the landowners, but by people as far off as the city of Oxford, and even by the Conservators of the Thames, who maintained the principle which was now more universally adopted than formerly—that it was not justifiable to supply a town in the Severn Valley from the Thames Valley. The result was that the South Cerney Bill was thrown out on the second reading. The Company's Bill then proceeded. The Commissioners had no scheme of their own; but in Committee they presented a scheme, more or less like the present one, for the supply of Cheltenham. Their contention was that the water was insufficient in quality; and there was, no doubt, a popular feeling that river water was not so pure as spring water, which, however, was very often an entirely mistaken opinion, because the real test of it was chemical

analysis. The Severn water, as proposed to be filtered by the Company, was beautiful water, and exceedingly soft; and the evidence of eminent chemists would satisfy the Committee that it contained no objectionable element whatever. He did not say that the water proposed by the Corporation was impure. It was very good water; but witnesses would prove that that proposed by the Company was better. It had the inestimable advantage of being entirely inexhaustible in supply, there being power to take about 3,100,000 gallons per day, and they would be able to supply Cheltenham certainly for the next two or three hundred years. According to the then practice of the House of Commons, the question of the quality of water, being considered an engineering question, was referred to the Referees, who entered into a minute inquiry, and reported that there was no objection to the water. The Bill passed the House of Commons. In the House of Lords the same objections were raised, and the Duke of Cleveland, the Chairman of the Committee, intimated, before the case was completed, that in the opinion of the Committee, who declined to give any opinion as to the quality of the water, it would be better if the Company would meet the difficulty which was raised by the Cheltenham people, by giving a supply for drinking from springs, and a separate service from the Severn for other purposes. That was considered by the Company, who endeavoured to arrange terms with the Commissioners; but it was found that the expense and inconvenience was so great that they could not do it, and, in consequence, the Bill was nearly defeated. It was prevented from being entirely defeated because it included provisions for supplying Tewkesbury, which had the first claim, the water being taken at that point of the Severn. There were also large capital powers taken, which the Company at present possessed. There was an unexhausted capital of shares, and borrowing powers in the usual proportion, amounting to about £90,000, and the present Bill proposed to raise an additional capital of £90,000. The whole £180,000 would not be raised immediately. The works were estimated to cost somewhat more than £100,000, and as soon as the supply for Cheltenham was completed, large districts not hitherto supplied would receive a supply. Building at Cheltenham would also be very much extended by the passing of the Bill, because the most valuable part of Cheltenham, which was built where the clay cropped on the surface, had no subterranean supply of water at all, and if a house in that district had not a supply from the Company it could not be built; therefore, there could be no doubt that there would be an unusually large increase of distribution. After the 1865 Bill was thrown out, the Company, having done everything in their power, thought it of no use to go to the springs which the Corporation now contemplated using, because they would have been met with an opposition they did not feel prepared to overcome. They hoped that in time the prejudice against the Severn water would be overcome, and in the meantime proceeded to supply the town of Tewkesbury, which had the great advantage of enabling the Company to test the quantity and quality of the supply. The Company had for some years supplied the town of Tewkesbury, and the water was found to be excellent; and it was the same water proposed to be now supplied for the town of Cheltenham. There was this advantage, therefore, that the Company retained their powers, and took the 3 million gallons asked for for the present supply of Cheltenham and Tewkesbury. The capital was also retained, but this was of less importance. The objection to the water proposed to be supplied was that it was river water, subject to the incidents of river water, one of which was that substances not altogether desirable were liable to be introduced into it. The Severn was of immense volume, which was a matter of the greatest possible importance, because the purity of the water depended very much upon the proportion of the volume of the water to any sewage or other matters which might be discharged into it. The water arrived at Tewkesbury in an excellent condition, except that it was liable to be turbid from floods. There was nothing unwholesome, however, in it, as it was of a peaty turbidity; and by the system of filtration adopted by the Company the water was at all times perfectly pure and bright. This was the water which was at present supplied to Tewkesbury, and it was proposed to supply Cheltenham with water of a similar description. If it were found that at any time the filters did not make the water perfectly clear, there was the additional security of the suspension of pumping until it was pure. The present Bill was introduced in consequence of the Corporation introducing their Bill. In 1865, after the failure of the Severn scheme, the Commissioners formally withdrew their standing notice, whereby they required the Company to provide 400,000 gallons of water, and consequently up to that time the Company were in the condition of a Water Company who could not supply the demands of the governing body of the town. After the Commissioners withdrew their notice, the Company ceased to be in that position, and were restored to their natural position of having the right to supply the town, as against the governing body. In 1870 the Commissioners again proposed a purchase, which the Company declined, and in the past year the Corporation for the first time gave notice of their scheme. It was in deference to the decision of Parliament that the Company had renewed their application for the Severn water, and as they were still convinced that it was the only sufficient and practical scheme, they now renewed it. The learned counsel then proceeded to deal with the several objections that would be advanced against the quality of the proposed supply from the Severn, the principal of which were the contamination from sewage and the tidal flow; but evidence, he said, would be called which would successfully refute all these objections. The wholesomeness of the water would be the principal issue for the Committee to decide. If the Severn was not a proper source of supply to Cheltenham, there remained the alternative of having the supply provided by the Corporation, which would be in dry weather a supply of not more than 400,000 gallons a day; but as they would not be allowed to supply it without purchasing the works of the Company, of course they were entitled to add to that the supply of the Company, which included Sandford Mead. In dry weather not more than 300,000 gallons could be counted on. Now 700,000 gallons was half what the Company proposed to supply, and this was obviously insufficient, and could not be enlarged. He did not know anything as to the landowners that would appear to oppose the Corporation scheme on the ground that they would not get water compensation; but, whatever their objections might be, the Company, held that, even if all the petitioning landowners were bought off—as two or three had already been bought off—it would remain a fact that a certain district would be deprived of water, and that probably a great many people who did not think of appearing against the Bill would be injured. The Corporation did not adhere to the uniform rule of Parliament to give compensation in water, and this was an inherent vice in their scheme.

Mr. BIDDER, interposing, objected to Mr. Venables pointing out "inherent vices" in the Corporation scheme, because the Company, in their petition against the Corporation scheme, did not in any way object to it as being imperfect.

Mr. VENABLES contended that in competing schemes it was customary for one party to show that their scheme was better than the other, and how could they do this without showing that the scheme of the one was good, and the scheme of the other was bad?

The CHAIRMAN said, in the opinion of the Committee, Mr. Venables was limited to his petition.



Mr. VENABLES said he would refer to a part of the Corporation Bill which was raised in the Company's petition—namely, compulsory purchase. The onus to justify compulsory purchase rested entirely on those who asked for it, and, in almost every case, Parliament had refused compulsory purchase either of gas or water-works. There were only two cases that he knew of in which compulsory purchase of water-works had been allowed, and one of those—that of Birmingham, two years ago—was decided on the ground that by an Act of 1852 the Corporation had already, with the consent of the Company, obtained the power. The other case was that of Stockton and Middlesbrough, and from the decision of the Committee on that Bill it was clear that the Corporation must, in the first instance, satisfy the Committee that they would give a better supply, and in the next place he did not know how the Corporation would get over the general objections, on principle, to compulsory purchase. The learned counsel then criticized in detail the statements in the petition of the Corporation against the Company's Bill, and said it was for the former to show that there was an overwhelming public advantage in breaking through the ordinary practice of Parliament, to which there had been only one exception, not to allow compulsory purchase. The Corporation must make out a very strong case indeed, and, on the other hand, the Company hoped to show that their plan would be conducive to the interests of the borough.

Mr. Wm. McLansborough, examined by Mr. VENABLES.

I am a Civil Engineer, and have been a Member of the Institution of Civil Engineers for nearly 20 years. I am also Manager and Engineer of the Cheltenham Water Company, and have held that appointment since 1864. The Company were incorporated in 1824, and since that they have had four Acts. Our district of supply comprises Cheltenham, Charlton Kings, Leckhampton, Prestbury, and Tewkesbury. The total population of these places is estimated at the present time at 52,787. The increase from 1871 has been taken at the same rate of progress as from 1861 to 1871. Cheltenham has been progressively increasing since 1821. In that year it had a population of 13,396; it now amounts to 43,000. The other parts have continued to increase more slowly. The present Bill seeks for further powers to supply the places along the line of route from Tewkesbury to Cheltenham. Ten per cent. has been allowed for the increase in the next ten years, bringing a total population of 4950 for the added districts not now supplied, and which are at present much in want of a water supply. The total population to be supplied under the extended limits would be 58,287. In 1873 it was estimated that Cheltenham and the added districts would have a total population of 71,595. The Banbury and Cheltenham Railway is now in course of construction. The number of houses in Cheltenham is 9137, the annual value £244,203; in Charlton Kings, 842 houses, annual value, £14,959; in Leckhampton, 646 houses, annual value, £17,123; in Prestbury, 253 houses, annual value, £7997; in Swindon, 40 houses, annual value, £471; in Tewkesbury, 1457 houses, annual value, £16,393; making a total of 12,375 houses, having an annual value of £301,146. There are about five inhabitants to each house. At the present time we supply in Cheltenham 3100 houses, having a value of £145,287; in Charlton Kings, 174 houses, annual value, £3669; in Leckhampton, 411 houses, annual value, £11,709; in Prestbury, 22 houses, annual value, £3060; in Swindon, we supply no houses; in Tewkesbury, 214 houses, annual value, £4368. Altogether we supply in the Cheltenham and Tewkesbury districts 3921 houses, having an annual value of £168,356. That leaves unsupplied in Cheltenham, 6037 houses, having a value of £98,915; in Charlton Kings, 668 houses, annual value, £11,289; in Leckhampton, 235 houses, annual value, £5413; in Prestbury, 231 houses, annual value, £4839; in Swindon, 40 houses, annual value, £471; in Tewkesbury, 1243 houses, annual value, £11,754. I regard 20 gallons per head per day as a proper supply for sanitary and domestic purposes. All the water supplied to Tewkesbury is from the Severn; that obtained at Sandford Mead is from a well. In 1864 our supply from wells was only 160½ gallons per minute, or 231,000 gallons per diem. That is our dry weather supply. In 1874 we were up to 280,000 gallons; and the average for four years, 1864, 1865, 1870, and 1871, was only 275,461 gallons. From Sandford Mead we can take, on an average, 200,000 gallons per day. We pump the whole of it through an independent main; it enters with the spring water, passes through the reservoirs, and is so distributed to the town. It is a very hard water, and we should be glad to discard it, and take Severn water in its place. At Tewkesbury we have constructed works for supplying Severn water to the town. The works were finished in March, 1870, and are adapted to supply 20 gallons per head per day to a population of 6000. From that time to the present the water has always been bright, and acceptable to the people. [Witness produced several samples of the Severn water, taken on different occasions.] In 1873, the Company having spent £7000 or £8000 for capital purposes out of revenue, it was thought desirable that the accounts should be put straight, and Messrs. Turquand, Young, and Co. were instructed to do it. The result of their inquiries was that revenue for capital purposes had advanced towards the cost of the Tewkesbury works £6291, and towards the Cheltenham works, £1055. The receipts of the Company in 1877 in Cheltenham were £11,336; expenditure, £3244 13s. 6d. In Tewkesbury the receipts were £671; expenditure, £254. The total receipts of the Company were thus £12,007 6s. The dividend paid for the first half of the year was 9 per cent., and for the second half 10 per cent. There are 63½ miles of mains. Our five storage reservoirs contain 34 million gallons. Our works at Tewkesbury are calculated to supply 12,000 gallons per hour. The total expenditure out of capital for capital purposes is £127,313 16s. 6d. We have never hesitated to take the water out of the Severn, no matter what condition the river was in; and I have never heard the water spoken of as other than of the highest quality. No complaints have been made. The Severn is one of the cleanest rivers in England, and the banks are free from everything that is objectionable. The nearest tide only reaches to about 800 or 900 yards from the weir. Whatever the state of the tide below the weir, it can never reach the top of the weir.

Cross-examined by Mr. BIDDER: Tewkesbury is a peculiar place. Out of 1200 or 1300 houses, between 700 and 800 are under £5 annual rate, and the first laying on of the water is a great tax on the people. We supply about one house in seven in Tewkesbury. Three-fourths of the cost of the Tewkesbury works has been paid for out of the money which might have been divided among the Shareholders as profits. It came out of the Cheltenham water-rates. Cheltenham has been comparatively stationary, as regards population, since 1865. Since that date we have made the works at Sandford Mead. A great many people do not like the water obtained there. The Company were prepared to incur the expense of supplying more water, if the Corporation said it was necessary. In consequence of our being in Parliament in 1865, we augmented the rates. We supply the better class of houses, and it is a matter of choice whether the poorer houses have our water or not. We only supply 300 odd houses in Cheltenham more than in 1865; but we have very nearly doubled our revenue there. For what may be called the luxuries of water supply, we have *carte blanche* to charge what we like. Cheltenham is a very heavily clothed town. We have not had of late years complaints of the oppressive character of the rates. In some cases of livery stables, &c., it is possible that we may have raised the rates five or six times. Prior to 1865, the part of the district on the clay paid more than the part on the sand; but in 1865 the rates were made uniform. I do not know of any case in which

we have refused to supply a house for domestic consumption, unless we were allowed to supply the livery stables at our own price. I do not know of our having received any complaints of our charges being unreasonable. We have expended about £24,000 since 1865. That included the costs of the application to Parliament in 1865, and the purchase of land and the spring at Pilford, which supplies the Leckhampton reservoir. The whole of that sum, except £2500, has been spent in the Cheltenham district. The cost of the application to Parliament in 1865 was £3400. We could not help that expense, as Cheltenham made us incur it.

Mr. BIDDER: Do not you think it would be worth while to provide adequately for your present district before you go to other districts?

Witness: In providing for our present districts we provide for the extended district. The extended district is a thinly-populated agricultural country.

Amongst your own Shareholders is there a great division of opinion as to the expediency of the transfer to the Corporation?—At the Wharnclyffe meeting of the Shareholders of the Company the voting was £72,000 in favour of this Bill and £6000 against it. That was not on the question of purchase, but of submitting our Bill for the approval of the Shareholders; but the Shareholders were quite aware of the Corporation Bill. There was no amendment moved at the meeting, and I did not hear any special objections. There has been a strong feeling created in the town, but it is dying out. It was a very unjustly created feeling against the Severn water. I think it was an entirely manufactured feeling, very disreputably got up. There is nothing like the feeling now that there was in 1865.

Re-examined by Mr. MICHAEL: The Company are subject to the restrictions and obligations of the Water-Works Clauses Act, and we are obliged to supply water to any person within our limit. In 1877 the Town Council asked us to extend our mains into the Sherborne Street district. They have the power, under the Public Health Act of 1875, to enforce the supply of water upon any persons if upon the report of the Surveyor it is shown that they have not a proper supply. They have exercised that power in some cases; but since we laid down our mains in the Sherborne Street district, I am not aware that a single step has been taken to put it in force; so, that we have had no return for our expenditure. No requisition has been made to us which we have refused to comply with. I know of no case where we have refused to carry out our parliamentary obligations. The Corporation have never complained of our not doing so. The well water from the sand-bed has been condemned by the Medical Officer, but the Corporation have not exercised their powers for compelling the inhabitants to take our water. We should have been very glad if they had done so.

Sir Brook Kay, examined by Mr. BAZALGETTE.

I live at Stanley Lodge, Battledown, in the parish of Charlton Kings, and have been a member of the Local Board for the last six or seven years. In dry weather there is a very short supply of water. We get our supply chiefly from wells, and part of the parish is supplied from streams. The Company have already taken water from Redwood and Northfields, both of which streamlets are in our parish. They are tributaries of the Chelt. There is not a proper supply of water for flushing the sewers, or for domestic requirements. I have examined the Tewkesbury works, and tasted the water. I am independent of the water supply myself; but I am told by the Medical Officer of Health that the sources from which I draw my supply are limited, and might fail. In that case I should be very glad to have the Tewkesbury water. I have not the slightest objection to it.

Cross-examined by Mr. BIDDER: If I had the choice, perhaps I should prefer spring water to the Severn water. No doubt we are fortunate, in the present case, that we have that choice, but I think it involves great damage to the parish in which I live.

Mr. BIDDER: You are looking forward to the passing of the Corporation Bill to secure you an adequate supply of water for flushing your sewers?

Witness: I am not aware of it. I believe some arrangement was made a few days ago to allow a portion of the water to flow down the river.

Dr. Daniel Devereux, examined by Mr. BAZALGETTE.

I am senior Medical Officer to Tewkesbury Hospital, and have practised in that town for many years. I consider that from a sanitary point of view the introduction of the Severn water supply has been a benefit to the town. Previously there was much typhoid fever. The drainage scheme and the new water supply were contemporaneously introduced. As the result, the amount of typhoid fever and epidemic disease has been reduced in a very marked degree.

Mr. BIDDER said he admitted that the introduction of drainage and water was beneficial to the town.

Examination continued: The Severn water is decidedly better than the supply we previously had from wells. I never use my well now. I have made rough analyses of the Severn water, and have found that it is purer than the pump water we had before. It is bright, and is pleasant to the taste. It is used in the Hospital. I have never heard any complaints about it.

Cross-examined by Mr. BIDDER: The wells in Tewkesbury, I believe, are very much polluted.

Mr. BIDDER: Therefore it was Hobson's choice—the Company's water or nothing?

Witness: In my house it was.

Mr. Allard, examined by Mr. BAZALGETTE.

I am Medical Officer for Tewkesbury. The water supplied to that town is pure, and fit for the purpose for which it is used. It is peculiarly soft, and that is a great advantage where the spring water is exceedingly hard, and contains a great deal of lime and chlorides. On the whole, the Severn water is better than the spring water. As delivered by the Company, it is bright and clear, and good to the taste. The bed of the river at Tewkesbury is very clear.

Cross-examined by Mr. BIDDER: I have been Medical Officer of Health at Tewkesbury four years, and Union Medical Officer for the last 25 years. I think very highly of Severn water. The water I use for domestic purposes is derived from springs; but if I were constructing a house of any pretensions I should not think of having wells. I believe the Corporation complained of the pollution of the river by the town of Worcester five or six years ago, and filed an information against them; but I do not recollect that the Tewkesbury people were very much dissatisfied with the condition of the river then.

By the COMMITTEE: There is no stench from the water. The mortality of the town, which averaged 141 for the ten years ending 1860, and 142 for the ten years ending 1870, has only been 114 for the last seven years, and 112 for the last two years.

(To be continued.)

TUESDAY, MARCH 19.

(Before Mr. SANDFORD, Chairman; Mr. HENRY CHAPLIN, Col. CARRINGTON, and Mr. DUNBAR.)

WEST HOUGHTON LOCAL BOARD BILL.

Mr. SALISBURY appeared for the promoters; Sir EDMUND BECKETT, Q.C., and Mr. PLMEROCKE STEPHENS for the Bridgewater Trustees. The petition



presented on behalf of Mr. C. J. Stonor and others was supported by Mr. CRIPPS, Q.C.

Mr. SALISBURY, for the promoters, said the Bill had been considerably altered, and was now a very simple measure indeed. It was promoted by the West Houghton Local Board of Health, who represented a population that had been constantly growing, and now amounted to about 9000. The increase of late years was due to the development of the mineral workings and the manufacturing industries of the district. Until the Local Board were formed in 1872, the district was entirely neglected in a sanitary sense; but for the last six years the roads and sewers and other necessary matters had been properly attended to. One of the first things the Board discovered, on getting into office, was the pressing need for some organized water supply. The district lay high, and there were no water-works whatever. The consequence was that fever and other diseases had largely prevailed amongst the population. The Board came to the conclusion, therefore, that it was for the public interest that an application should be made to Parliament for powers to supply the district with water. Two years ago a Commissioner of the Local Government Board was sent down to inquire into a scheme the Board were then promoting. Nothing, however, was done at that time; but last year a Provisional Order came before the House of Lords, but it was thrown out on a question of mere form. The Committee considered that the promoters had gone beyond their powers, and that they could not proceed. The present Bill, as originally deposited, was one to empower the West Houghton Local Board of Health to make water-works and to acquire the undertaking of the West Houghton Consumers Gas Company, and for other purposes. One of the objections set up by the opponents of the Bill during the inquiry two years ago was that West Houghton ought to obtain its supply of water from Bolton, which was near to, but not within, the district. But, as a matter of fact, the Bolton Corporation were not then in a position to give a continuous supply. They could only give a supply to the extent of their surplus, and then if the necessities of Bolton required all the water, West Houghton would have to go without. Since the original Bill of the present promoters was lodged, the Bolton Corporation had come forward, and entered into an agreement with the West Houghton Local Board to supply them with water continuously and for ever. So that all previous difficulties as to the continuation of works and the taking of land were got rid of altogether.

The CHAIRMAN: But are we to alter the preamble of the Bill?

Mr. SALISBURY said that had been done. The promoters did not propose now to acquire the Gas Company. The only remaining opponents of the Bill were Mr. Stonor and the Bridgewater Trustees, and the former, in his petition, made this extraordinary allegation: "Since the preparation of the foregoing paragraphs of this petition, it has been intimated to your petitioner that the promoters will ask the Committee to whom the said Bill will be referred to strike out of it all the powers which it now contains for the appropriation of the land and waters of your petitioner. Your petitioner was put to very great expense in contesting the scheme last session, and has again been put to considerable expense by the promotion of the present Bill. Your petitioner is advised that the promotion of both these schemes was merely intended to force into terms more favourable to the Local Board of West Houghton, the Corporation of Bolton, whom your petitioner indicated in his petition of last session as the source from whom a water supply for West Houghton could be best obtained. Your petitioner humbly submits that he has been unreasonably subjected by the promoters to expense in defending his rights, . . . and that he should be allowed to recover from the promoters the costs to which he has been put by them."

On behalf of Mr. Stonor it was stated that his petition now related entirely to the question of costs.

Mr. SALISBURY stated that every form required by the House had been complied with in regard to the amended Bill, and that the inhabitants of Bolton had been afforded every information as to the nature of the application to be made to Parliament. That being so, and as there was no doubt as to the necessity of a water supply for West Houghton, he trusted the Committee would pass the preamble of the Bill.

Mr. Pennington, Clerk to the Local Board, gave formal evidence in proof of the preamble. The water at present used at West Houghton was derived, he said, from wells and streams; there was, in fact, no proper supply at all, so that the scheme proposed was urgently needed.

After a short consultation between the parties, one branch of the opposition of that body was withdrawn conditionally upon the insertion of a clause giving the Bridgewater Trustees power to do certain things, at their own expense, with the pipes intended to pass through the estate.

Mr. CRIPPS addressed the Committee in support of his application for costs for Mr. Stonor, but

The CHAIRMAN ruled that the Committee had not the power to grant it. The preamble was declared to be proved, and the clauses having been gone through, the Bill was ordered to be reported.

## Legal Intelligence.

### HIGH COURT OF JUSTICE—CHANCERY DIVISION.

TUESDAY, MARCH 19.

(Before Vice-Chancellor MALINS.)

GLOSSOP v. HESTON AND ISLEWORTH LOCAL BOARD.

Mr. GLASSE (Mr. STURGES with him) appeared in this case, which had stood over several times, and said the plaintiff was now in a position to ask his lordship for a decision. The statement of claim was delivered on the 24th of July, 1876, notice of motion was given for the 27th of that month, and the motion came on on the 3rd of August, 1876, when the defendants represented that they were doing their best to remove the alleged nuisance. The motion was then ordered to stand over till Michaelmas sittings, with liberty to apply, if necessary, in the meanwhile. On the 30th of November, 1876, it came again before the Court. The defendants again stated they were using their best efforts to abate the nuisance, and the motion was ordered to stand over again till the first motion day in March, 1877. It once more stood over till the 11th of May, and on the 11th and 12th of May it was heard, and judgment given. His lordship, when he delivered judgment, without calling upon the defendants, said, instead of granting an injunction, he would order the case to stand over for a certain period, in order to enable the defendants to see what they could do. The plaintiff (Mr. Glossop) was the occupier of Silver Hall, where his father lived before him, and 30 or 40 years ago there was a pure stream which ran through the grounds. It also worked a mill, and when the mill was not at work the water was dammed up. When it was at work the stream was a rapid and deep one. During the last 30 years, if not during the last 10, there had been a large increase in the population of the district, and it was evident that the sewer did now drain into the stream, and the more the inhabitants the greater the nuisance. The nuisance had increased to such an extent that the Court was satisfied that Mr. Glossop had reason to complain. Nothing had been done from the time his lordship gave judgment, except for the Local Board to squabble amongst themselves. The plaintiff had pointed out to the Board

that they might remove the nuisance in an inexpensive way, which could be adopted by any scheme which might be brought forward; and in July last he wrote a letter to the defendants, in which he said the numerous instances of illness amongst the members of his family, attributable, he believed, to the emanations from the stream, and the fact that, during several days, men in the service of the Board had been employed in removing obstructions in the sewer, and thereby increasing the flow of sewage in the Crane, just above his house, compelled him to call attention to the subject once more. He also pointed out that the Board had taken no effectual steps to remedy the evil complained of, and, under the circumstances, without in any way interfering with his rights under the action which he had been obliged to commence in the Court of Chancery, he propounded a scheme which, if carried out, would remove all cause of complaint. He also pointed out that he had been obliged to leave his house on several occasions, on account of the nuisance complained of, and that he was obliged to send his family to St. Leonards from the same cause.

The VICE-CHANCELLOR: What is to be done?

Mr. GLASSE: I cannot help it if they have to poison somebody else—they have no right to poison me. [He then read an affidavit by Mr. Hickson Briggs, made on the 13th of March, detailing the correspondence which had taken place with the Local Government Board, and also saying that a local inquiry would take place as soon as the engagements of the Inspector would permit.]

The VICE-CHANCELLOR: Has that been done?

Mr. STURGES: The inquiry was held at Kingston, but the result of it is not known.

Mr. HIGGINS, Q.C. (with him Mr. METHOLD): The result was not known on the 16th of March, but the inquiry was with respect to the proposed inclusion of the Heston and Isleworth Local Board, in the Lower Thames Valley Drainage scheme.

Mr. GLASSE: There is nothing but an attempt not to proceed, and I ask your lordship to put the powers of the Court in operation.

The VICE-CHANCELLOR: When will Colonel Cox make his report?

Mr. HIGGINS: We expect it every day.

The VICE-CHANCELLOR: He may relieve Mr. Glossop of all the difficulties.

Mr. HIGGINS: Certainly.

Mr. GLASSE: Colonel Cox is only to inquire whether they should be allowed to join the joint Board. If they do, it will not relieve Mr. Glossop. The joint Board have not a scheme ready. We are being played with. I really must ask your lordship to put us out of our misery, because Colonel Cox is not to inquire how to remove the nuisance, but whether the Board are to be allowed to join. If they are, what then?

Mr. HIGGINS: They will be *functi officio*.

Mr. GLASSE: Then in five or six years time something may be done. What cares Mr. Glossop whether they join the Board or not? Your lordship was satisfied before with the evidence that the nuisance existed.

The VICE-CHANCELLOR: I see they themselves use the expression, "Abate the nuisance now existing."

Mr. GLASSE: They admitted that a nuisance was existing on the 12th of May, and since then they have done absolutely nothing.

WEDNESDAY, MARCH 20.

Mr. GLASSE resumed his address in this case, saying he should not trouble the Court by reading in detail the evidence which was previously before the Court, but cited, in support of his contention that the plaintiff was entitled to the relief, *Spokes v. Banbury Local Board*, *Attorney-General v. Colney Hatch*, *Attorney-General v. Birmingham*, and *Goldsmidt v. Tunbridge Wells*. He said the plaintiff did not desire to do anything unnecessarily annoying to his neighbours. If any reasonable time could be granted, let it be done.

Mr. HIGGINS: It is in evidence here that the bargemen drink the water and like it.

Mr. GLASSE: But you do not know what they mix with it.

The VICE-CHANCELLOR: I suppose if I am satisfied of the existence of the nuisance the consequences must follow. The rule is laid down by Lord Hatherley that, if the Court grants an injunction, those against whom it is granted must find the means of obeying it. It almost resolves itself into this, that it is not safe to take a residence, or buy any property, near to which a stream runs.

Mr. GLASSE said the plaintiff, living in the neighbourhood, knowing the parties, and desiring to be on good terms with them, was by no means anxious to behave otherwise than handsomely, and if there was any time within which the defendants thought they could abate the nuisance, well and good. But what they were proposing now was a thing which would last five or six years, because they only applied for leave to join some general scheme.

The VICE-CHANCELLOR: How wide is the Crane as it passes through Mr. Glossop's grounds?

Mr. HIGGINS: It is narrow at each end, and wide in the middle.

Mr. GLASSE: Where it passes under the road by a culvert it is narrow, and it is narrow at the other end.

Mr. GLOSSOP: The average is about 12 feet wide.

Mr. GLASSE: There is a bridge in the middle, and at the far end of the stream is a mill occupied by Mr. Podger. When this suit was commenced Mr. Podger was a member of the Board, and therefore would not complain; but he does not live at the mill.

The VICE-CHANCELLOR: Who is living on the stream besides Mr. Glossop?

Mr. GLASSE said there were several small cottages and almshouses. There was an affidavit made by Mr. Carter, who lived above Mr. Glossop, and he said he had lived in the parish of Isleworth 31 years. He was well acquainted with the Crane, and the premises and gardens of the plaintiff. He recollected that some years since the stream was much purer than it was now. Just above his house and premises, about half a mile from the plaintiff's, the sewage of Spring Grove and Woodlands flowed into the watercourse, and thence into the Crane. The watercourse was frequently most offensive from the sewage passing through it. The watercourse had become much worse during the last few years. Formerly he used to catch eels in the watercourse; but it was now so filthy that, in his opinion, no fish could live in it. Sometimes a great body of foul matter came down like the overflow of cesspools; and the whole of this, as it ran into the Crane, must pass through the plaintiff's garden. The engineer of the defendants—Mr. Austin—said it could all be set right for £1000, and the plaintiff had propounded a scheme for £600 or £700.

The VICE-CHANCELLOR: What is the value of Mr. Glossop's house and grounds?

Mr. GLOSSOP: £10,000.

Mr. HIGGINS: It is only rated at £160.

Mr. GLASSE said there was an affidavit by Mr. Waler Baynham, the Inspector of Nuisances to the Brentford Rural Sanitary Authority (who were the predecessors of the present Board) for three years expiring on or about February, 1875, whose district included the parishes of Heston and Isleworth, and as such Inspector he said he had become acquainted with the entire sewage system of Heston and Isleworth, all of which was



under the control of the defendants. He stated that in May, 1874, he was directed by the Brentford Board to furnish a report of all the drains, &c., discharging into the Crane, and he did so on the 7th of May, 1874. He verily believed that almost the whole of the drains and channels conveying sewage ultimately found their way to the River Crane. He had repeatedly seen the drains opened, and the quantity of black foul deposit taken out of them was very great. He took a sample of the Spring Grove drainage, which he found most offensive. He had seen most offensive matter in the open ditch, and the stench arising therefrom was, at times, most abominable. He had seen human excrement and other offensive matter especially from two butchers' premises there. Upon cross-examination, the witness said there had been a visible increase in the nuisance of late years. After reading from the minutes of the Board, the learned counsel said the defendants had acquired no statutory right to commit the nuisance, and, therefore, must be restrained.

The VICE-CHANCELLOR: I must say that when the case was before me on the former occasion, I thought there was an admission on the part of the defendants that a nuisance existed.

Mr. HIGGINS: There was no admission by me. If there was any admission, it was made by Mr. Glasse for me. My representation was that we were taking steps to consider the best mode of dealing with the whole question of sewage and drainage for the neighbourhood.

Mr. GLASSE said the fourth paragraph of the statement of defence admitted that the sewage was not disposed of in a proper manner. He then proposed to refer to the minutes of the Board at their first meeting after the notice of motion was given.

Mr. HIGGINS objected that these minutes could not be read in evidence. The VICE-CHANCELLOR: Then why did you produce them?

Mr. HIGGINS: Because your lordship ordered it.

The VICE-CHANCELLOR: You are a public body.

Mr. HIGGINS: But a public body is entitled to protection.

Mr. GLASSE said in March last year the defendants produced a notice from the Thames Conservancy, which notice said that whereas sewage and offensive and injurious matters were caused or suffered to flow and pass into a river or watercourse known by the name of the River Crane, which river communicated with the Thames, the Conservators of the Thames, in exercise of the power and control given to them, required the defendants to discontinue, within 13 months from the date of the service of the notice, the flow or passage of sewage, or any other offensive or injurious matter, into the river or watercourse known by the name of the Crane, by or through any channel under their control. Further, they required the defendants to discontinue, within 13 months from the date of the service of the notice, the flow or passage of sewage from any and every sewer, &c., under the defendants' management or control into the Thames. They required the defendants further to take notice that if they failed to discontinue it within the time allowed, they would be guilty of a misdemeanour, and be liable, upon conviction, to penalties not exceeding £100, and to a further penalty, not exceeding £50, for every day during which the nuisance should continue. He then read an affidavit of Mr. Richard Lord, Superintendent-General of the Thames Conservancy, who said he was well acquainted with the sewers and drainage of Heston and Isleworth, it having been his duty to examine the same with a view to preventing sewage matter going into the River Crane, which was one of the tributaries to the River Thames, received into it about 250 yards above the garden of the plaintiff. From the commencement of the watercourse it received into it a great quantity of sewage matter, and the overflow from cesspools, &c. In the month of October he made an inspection of all the drains on behalf of the Conservancy, and knew that the Thames Conservancy Board had given notice to the defendants to divert the sewage of the district. He had since made an inspection of the drains, &c., and found them in much the same condition as previously, large quantities of sewage matter being allowed to find its way into the Crane. He (the learned counsel) should have thought the Thames Conservancy would have forced the defendants to go on; but they seemed to have baffled the Thames Conservancy by raising a difficulty which really did not exist, because at a trifling expense the sewage might be diverted so as to become a part of any system which might hereafter be adopted. Therefore, he maintained that he was entitled to the injunction. But, at the same time, he tendered and proffered, on the part of Mr. Glossop, whatever the Court thought reasonable by way of extension of time. His lordship had on the former occasion expressed an opinion that it was a nuisance.

Mr. HIGGINS: Or the plaintiff is a nuisance.

Mr. GLASSE: Or the Local Board are a nuisance. They live by stirring up stinks, and get to like them. But Mr. Glossop does not, nor do the members of his family, who have been seriously injured by them.

Mr. HIGGINS then opened the case for the defendants, and said that, according to the plaintiff's own statement of claim, the Local Board were not constituted until November, 1875, nor had they any existence until then. Having been constituted, then, under a public Act, a writ was served upon them on the 12th of July by the plaintiff, in reference to a state of things which had existed, with hardly any alteration, for probably more than 100 years.

The VICE-CHANCELLOR: Before Mr. Glossop or his ancestors went there.

Mr. HIGGINS: Yes, long before Mr. Glossop or his ancestors ever went to Silver Hall. The Local Board desired to treat Mr. Glossop with great respect, but they had public duties to discharge, and must defend themselves. The peculiarity of the case was that the plaintiff did not allege there was a single new drain, a single new sewer, or a single new connection with the sewers, of which he had a right to complain. All he complained of was that the water was offensive in the river, and that there were drains into it which must have existed from time immemorial. He would show the Court that in all probability the amount of drainage going through those drains was less than it was 100 years ago, or, at all events, had not been perceptibly increased within the memory of man. Under various Acts of Parliament, altogether independent of prescription and usage, public sanitary bodies had imposed upon them the duty of making a system of sewerage for each district, and preventing any kind of pollution of streams. Altogether independent of nuisance, of which any private individual could complain, the Thames Conservancy, or the Attorney-General, might say to any sanitary body: "We find provisions in public Acts, and whether you or your predecessors have been for 20 or 100 years polluting a stream, you must make sewers and drainage, and divert the sewage from the river." That would be a right to be enforced by the Attorney-General. Therefore the Board, knowing there were statutory provisions which the public had a right to enforce, had ever since been doing their very utmost not to abate a public nuisance, but to comply with statutory provisions with which they were bound to comply, altogether independent of the consideration of private rights. And no great time had elapsed, considering the immense difficulty of the subject, and having regard to the fact that the Board came into being only in November, 1875. He should ask his Lordship to come to the conclusion that they had allowed no opportunity to pass without an attempt to do that which they ought to do in furtherance of the scheme intended by the Legislature, of diverting throughout the country every drop of sewage from all the streams

of the country. The Board had consulted various professors of the art of dealing with sewage, and different plans had been suggested.

The VICE-CHANCELLOR: Has Sir Joseph Bazalgette been consulted?

Mr. HIGGINS: I am told not. I am told his plan is irrigation. The A. B. C. process at Aylesbury, I am instructed, is eminently successful.

The VICE-CHANCELLOR: I saw the process at Leamington, and it certainly appeared to be so; but if Mr. Glasse is right, something must be done, and the question is what that something should be. That has been the difficulty throughout.

Mr. HIGGINS said there was a report by Mr. Moore, who was consulted, dated Nov. 2, 1876, by which it was proposed to construct a complete system of sewerage and sewer works for Heston and Isleworth, at a cost of nearly £27,000, and unless the defendants were compelled by the Local Government Board to combine with others, the scheme so recommended, or some other, would be carried out as soon as possible. Mr. Moore's scheme was for the adoption of the A. B. C. process, dealing with the matter separately from other District Boards, but it embraced the compulsory taking of land, and there was the difficulty. The defendants could not get the land except by virtue of a Provisional Order, having statutory force and effect, from the Local Government Board, which was a very important public department, and when the scheme came before that public Board it was disallowed. Major Tulloch went down, and the Duke of Northumberland objected, as well as other landowners, so that in the result the scheme was rejected. They would not issue the Provisional Order, and then it became necessary to consider what other plan could be adopted. The next point was whether, after all, it was not more advisable that there should be one general scheme for the Thames Valley. The Thames Conservancy said it was nonsensical for each district to be dealing separately with its sewage, but the proper thing was to have a joint Board, and a scheme had been under consideration for a long time, which was a general scheme. On Oct. 19, 1877, the Solicitors of the Thames Conservancy, acknowledging an application for an extension of time, said, having reference to the powers conferred by the Act 40 & 41 Vict., cap. 229, and to the Local Government Board being unprepared to issue the Order applied for, they were instructed by the Conservancy to inquire whether the Board intended to take the steps provided by the Act for being included in the united district for the purpose of disposing of the sewage, and also to state that, if those steps were not at once taken, it would be the duty of the Conservators to take proceedings, without further extension of time, against the Board. Therefore the defendants were required by the Thames Conservators at once to make application for being admitted to what was called a scheme for the drainage of the Thames Valley, and becoming members of a joint Board as defined by the Act of Parliament. The Legislature thought it advisable that there should be a general scheme of main drainage for the Thames Valley, and the Act provided how that scheme should be carried into effect.

The VICE-CHANCELLOR: You say you have a right, under the Act, to become members of the joint Board?

Mr. HIGGINS said they had done everything they could. Step after step had been taken. The Solicitors to the Thames Conservators said that if the Board would do what they might do, and what they ought to do, they would not be troubled, but they must take the proper steps. The first step was to give the notice required. That had been done. It had been met by a counter notice on the part of the joint Board, which had raised some questions as to the terms upon which the defendants were to be admitted to join that Board. That matter was now before the Local Government Board, and a final report upon the matter was expected every day. When the joint Board were constituted they would be the proper defendants to an action like the present. The learned counsel then read an affidavit of Mr. Ashby.

Mr. George Crowley Ashby, cross-examined by Mr. GLASSE.

I have a wife and three children. My wife is still alive, and is in excellent health. I have never suffered from sore throats or from fevers. My youngest child is not quite 15, and my eldest not quite 21. I have not had a doctor in the house for twelve months. My family have not suffered from low fever. One of my children had scarlet fever, and another a sore throat four or five years ago. We have one water closet in the house, and a privy at the bottom of the garden at the side of the stream. I am not Chairman of the Local Board. I was at the commencement, but I ceased about six months after its formation. No doubt my house drains into the river. From the water-closet in the house there is a pipe which communicates with the privy, and thence, I suppose, with the water.

By the COURT: All the drains in my house go into the Crane, and others too, I suppose.

Cross-examination continued: There used to be dace and eels in the river. I have put night lines down, and in the morning I have caught some. I put the lines some 20 or 30 yards from the closet. The eels were very nice indeed. I do not think the river can be clearer than it is usually. When it is not clear it is after heavy rains, like all other rivers. I know Mr. Samuel Rayment. I do not suppose I have talked with him a dozen times in my life. I do not talk with Mr. Rayment, and I do not think I ever talked with him about this matter. I have talked with other people about it. I have talked to my wife about it.

Mr. GLASSE: That is a privileged communication.

Cross-examination continued: I have talked to my friend, Mr. Podger, about it to-day or yesterday. I think I was not Chairman of the Board when the action commenced.

Re-examined by Mr. HIGGINS: I am Chairman of the Board of Guardians for the Brentford Union, and have been so about eleven years. Silver Hall was to let, and I made application to Mr. Glossop's agent asking for particulars. I can account for the river passing through the grounds of Silver Hall being in a worse condition than it is outside. The plaintiff has ducks upon his ground, and there are many trees about. I have seen the river this morning at the bottom of my garden; it was clear. I am below Silver Hall. As it came from Silver Hall it was clear. I do not visit Mr. Glossop. I went there once or twice to see the grounds when the house was to be let. The river is about 8 feet deep generally. When the water is a little lower than that I can see the bottom clearly, and pebbles at the bottom. The River Crane is not at all affected by the tide. Whether the mill is going or not, it does not affect the height of the water. I have never noticed any smell on any occasion.

By the COURT: I have lived there 22 years. During the whole time I have never, when walking in my garden, perceived any unpleasant smell there. I am perfectly clear as to that.

The VICE-CHANCELLOR: You affirm that, "during the whole 22 years I have lived in my house, I have never, either in my house or in my garden, perceived any unpleasant smell from the river"?

Witness: I do, my lord. It is a continuous stream, and anything passing down goes into the River Thames. My son and daughter had scarlet fever four or five years ago; they were attended by a medical man. It was not suggested that the fever was caused by the stream. Scarlet fever is one of the ailments which are incident to children. There was no typhoid or typhus fever.

Mr. METHOLD then read an affidavit of Mr. Podger, who said that for about 40 years he had been connected with Isleworth Manor Mills, and during all the period he had been at the mill he had not found the river



offensive. He had frequently seen the men who worked on his barges drink water from the river. They filled their casks with water from the river, to drink while they were away. His late partner lived at Walford House, connected with the mill, for upwards of eleven years, and last year laid out a large sum in enlarging the ornamental water in the grounds, which was filled from the river. He had seen fish in that water, and his sons had bathed in it close to the mill head.

Mr. GLASSE said he did not propose to cross-examine the witness.

Mr. HIGGINS said the witness had been ordered to attend, and he had a right to ask him any question he desired.

Mr. GLASSE replied that there was a consent to take the evidence by affidavit.

The VICE-CHANCELLOR was of opinion that an agreement to take evidence by affidavit did not preclude Mr. Higgins from his right of calling witnesses. If a witness, who had made an affidavit, were in Court and ready to be cross-examined, he thought it was the duty of the Court to obtain the best information it could in order to arrive at a correct conclusion. Here was a witness who occupied property on the stream in question, and he thought any parties who desired to add to their evidence had a right to do so *in vivo*.

Mr. William Podger, examined by Mr. HIGGINS.

I reside at Isleworth. I live at Walford House, the residence of my late partner. I shall have lived there 22 years next June. A branch of the River Crane runs in front of my house through the centre of my property. It is a portion of the Crane after it has passed Silver Hall. The width of the stream varies; some of it is 40 feet or 50 feet wide. It was cut out by my late partner as an ornamental fish-pond. I keep a large boat on the lake. In the narrower portion, which has not been widened, it is 12 feet or 14 feet in breadth, and about 6 feet deep in the centre. It flows nearly a quarter of a mile through my grounds. It runs from my lands to the Duke of Northumberland's water. After it leaves me it runs through a ditch to the Duke's pond, which is a great many acres. It is a very large ornamental water. As far as I know that piece of water is not fed by any other stream. I bought the property of the Duke, and am bound to let a certain quantity of water go through there when I am not using it for the mill. The water goes direct into the Duke's pond from me. It comes to me from Silver Hall, as it leaves there. I can hardly help seeing the Duke's water from my place. It is in a clear condition. I have seen the water flowing by my house in my garden this morning. I saw the river this morning. I took a bottle of water from it, which I now produce. It was dipped out in my presence, by my gardener, opposite Mr. Ashby's house. I never, in my life, smelt anything offensive from the river. When there have been heavy rains the water is discoloured; but I have never seen any discoloration except from floods. The water in the bottle represents the usual state of the water in dry weather. The river opposite Mr. Ashby's is about 10 or 12 feet wide, when it gets past the almshouses it gets much wider. There is a grating inside Mr. Glossop's grounds, which may cause leaves and other things to accumulate there.

[Mr. Samuel Rayment, the Manager of the mill, who had made an affidavit, was then tendered for cross-examination; but Mr. Glasse, declined to put any questions to him. His affidavit was in substance a corroboration of Mr. Podger's evidence.]

Mr. METHOLD then read an affidavit by Mr. C. W. Crane, who said that for six or seven years he had been engaged by Messrs. Podger, the proprietors of the mill, as a bargeman, and that he had never experienced any offensive smell from the mill pool; that he had used the water from the mill pool for drinking, making tea, and other purposes, and, when on a voyage, he had frequently kept it in a cask for seven or eight days, and it had been invariably good.

[This witness was also tendered for cross-examination, which was declined.]

Mr. HIGGINS said Mr. Glasse had insisted on his right to have the witnesses in Court, and they had attended at considerable inconvenience. He then proceeded with his argument on the part of the defendants, and said the evidence for the plaintiff was of the most trivial character. The plaintiff called a number of witnesses, one of them being Dr. Bullock, who spoke to the illness of plaintiff's family. He said he had lived at Spring Grove for 20 years, and had attended the members of the plaintiff's family, who had been affected with low fevers and sore throats, to which he said they were "more susceptible from the state of the River Crane." He said he attributed this to the deleterious exhalation of gases from the River Crane, which became worse as buildings in the locality increased. When cross-examined, he had said that he never observed an offensive smell arising from the river, and it was remarkable that the illness in his family, of which the plaintiff spoke, was during, preceding, and following the emptying of what had become a huge cesspool in the plaintiff's own grounds.

The VICE-CHANCELLOR said the most extraordinary thing was that the smell existing in Mr. Glossop's grounds, and producing all the discomforts which had been spoken to, was not perceived by his neighbours.

Mr. HIGGINS said Mr. Walter Baynam, who was in Mr. Glossop's grounds in July, said there was no offensive smell, but the water was murky and dark; and it was remarkable that all the cases of illness of which the plaintiff spoke occurred not in the summer, but in the spring and autumn. Mr. Crawshaw, on the former occasion, said he had frequently seen water plants in the river just where the Twickenham Road crossed the Crane, and it was perfectly clear the plaintiff's evidence entirely broke down, as far as the growth of water plants was an *indivium* of the state of the river. There the plaintiff's evidence was that the condition of the water plants and the number of the water plants, both above and below the plaintiff's grounds, were neither better nor worse than they were many years ago. Upon the question of smell, there was a general vague statement by the plaintiff himself, of which there was no corroboration worth speaking of. But there was very plain contradictory evidence, such as that of Mr. Podger, Mr. Ashby, Mr. Crane, and others. What were the facts, *a priori*? There was a very great volume of water, narrowed, no doubt, at two points in the plaintiff's grounds, and one cause of that of which the plaintiff complained was doubtless the narrowing of the river, as it came into and went out of his grounds, because the effect of that narrowing where there were a great number of trees discharging their leaves into the river, was that the grating kept them and other things back, which decomposed and caused noxious smells. The plaintiff seemed to be in a species of hallucination, for having discovered and emptied one large cesspool, he opened another within a few feet of his own house, which was unconcreted, so that the whole ground about was saturated with faecal matter, which must flow into his own water. So that it might well be that within the plaintiff's grounds there was an offensive smell, whereas outside there was none. The plaintiff, in fact, bottled up the smell for home use. The very same river flowed by Mr. Podger's premises—of course, more slowly, because it was a larger volume of water—right out to the Duke's ornamental water, without any cleansing or screening, and of that no one complained. The population which could drain into the Crane had only increased to the extent of 5000 in 50 years. Whereas there were 10,000 persons now, 50 years ago there were but 5000, but steps had been taken to prevent a number of these draining into the

Crane, and the Board had succeeded in preventing many of the worst sources of pollution within the last year or two.

MONDAY, MARCH 25.

Mr. HIGGINS resumed his argument in this case on behalf of the defendants.

The VICE-CHANCELLOR: Tell me what conclusion you want me to arrive at.

Mr. HIGGINS: That this case is entirely misconceived.

The VICE-CHANCELLOR: You want me to dismiss the action?

Mr. HIGGINS: Yes, my lord.

The VICE-CHANCELLOR: With costs?

Mr. HIGGINS: Yes. I do not see why Mr. Glossop should escape the costs. In the first place, I say, having regard to the fact that the defendants were only constituted a Board in November, 1875, it would have been proper on the part of the plaintiff to have felt the responsibility which rested upon him to make out a case of increase of nuisance. We say there has been a discharge of sewage from time immemorial into the River Crane.

The VICE-CHANCELLOR: I do not understand the other side to dispute the discharge of sewage into the river.

Mr. HIGGINS: All the cases go to show that a private individual must prove that there is such an increase in the discharge of sewage as produces an injury to his property; that there is no prescriptive right, but that the Attorney-General has a right, on behalf of the public, under Act of Parliament, to ask for an injunction. The evidence in the case discloses that the two sewers in question, discharging above the bridge, have been in existence for probably more than a century. In the case of *Goldsmidt v. The Tunbridge Wells Commissioners*, the Local Board had made a number of new drains.

The VICE-CHANCELLOR: You say in this case the Board have made no new drains.

Mr. HIGGINS: Just so, my lord. But we have tried to prevent drainage into the river, and have succeeded to some extent. The Local Board have not constructed a single inch of new sewers. In the cases which have been cited against me, the increase of nuisance was owing to acts of the defendants; but here the minutes of the Board show that they were anxious to abate, as far as they could, anything like a nuisance. The evidence as to the state of the river in the plaintiff's own grounds is almost *nil*; and if the plaintiff's does not take a very exaggerated or sentimental view of his property, he ought to be in a position to produce a number of persons to speak to the state of the river above and below his grounds; but he has done nothing of the kind.

The VICE-CHANCELLOR: It has occurred to me to send some one down to view, and report to the Court.

Mr. HIGGINS: I should not object to anybody going down to do so to-day or to-morrow.

The VICE-CHANCELLOR: I did that in the Colney Hatch case.

Mr. GLASSE: I do not see why it should not be done, if both parties agree to it.

The VICE-CHANCELLOR: I will unfeignedly state that I have seldom had a case in which I felt more difficulty or embarrassment. Contradictory evidence I am accustomed to; but here I have Mr. Glossop, with the river running through his grounds, complaining; whereas another gentleman, occupying property only separated from Mr. Glossop's grounds by a stable, says he has never perceived any unpleasant smell. Which am to give credence to, when both are highly respectable witnesses? I must pay attention to what Mr. Ashby says, and Mr. Podger takes the house in which his partner lived, and in his grounds he has a private sheet of water supplied from this source.

Mr. GLASSE: I shall raise no difficulty if your lordship will fix on some surveyor, to be attended by one person on each side.

The VICE-CHANCELLOR: If I had a Jury, I should call their attention to the evidence, and they would decide.

Mr. HIGGINS: If your lordship thinks it a right thing to do, we are a public body, and offer no opposition.

The VICE-CHANCELLOR: I have read every affidavit, and having done so, find myself in a state of great embarrassment. I think the better plan will be for each of you to supply me with three names. Has Colonel Cox made his report yet?

Mr. HIGGINS: We have not heard, my lord.

The VICE-CHANCELLOR: That would not affect this question, because his inquiry relates only to whether you are to join in a general scheme. Another course would be, if I find myself so much embarrassed by the evidence, to send it to an issue. If you will give me three names on each side, I will select one.

Mr. HIGGINS: The Surveyor sent down would not have to inquire into increase of nuisance, but simply as to the state of the water.

The VICE-CHANCELLOR: Just so. In every one of the cases in which the Court has interfered, I think, the Board had done something.

Mr. GLASSE: Or allowed a greater number of drains than previously existed.

Mr. HIGGINS: I raise no objection, because I think the Court ought to be in possession of all the information possible.

The VICE-CHANCELLOR: I think that is very fair on both sides.

Mr. HIGGINS: I understand the reference will be as to the state of the river passing through the plaintiff's grounds, and above and below.

The VICE-CHANCELLOR: The substance of it will be whether, in consequence of sewage pouring into it, the river is in such a state as to materially interfere with the comfort and enjoyment of the plaintiff's residence. I cannot interfere for a trifling injury.

Mr. METHOLD: Under the Judicature Act, the Court has power to refer for a report and for decision. This will be a reference for report.

The VICE-CHANCELLOR: Yes; and the costs will have to be decided hereafter.

WEDNESDAY, MARCH 27.

This case was mentioned this morning, Mr. Higgins stating that the parties had agreed on the terms in which the matter should be referred to some gentleman to report, and each side had named three gentlemen from whom the Court would select one. The gentleman appointed, it was agreed, should report to the Court whether the sewage matter now flowing into the River Crane through the drains and channels under the control of the defendants, so affected the river as materially to interfere with the comfort of the plaintiff's house. The plaintiff had named Dr. Frankland, Dr. Odling, and Dr. Robertson; the defendants, Lieut.-Col. Hope, Dr. Corfield, and Dr. Whitmore. The Vice-Chancellor having selected Lieut.-Col. Hope, it was arranged that he should be communicated with to see if he could undertake the reference; if not, one of the other gentlemen named would be selected. It was also arranged that one person on each side should attend the referee when making his inspection.

FIRST V. LONGWOOD GAS COMPANY.

Mr. GLASSE, Q.C. (Mr. Rigby with him), appeared in this case, in which an interim order had been made, and the action now came on for decision. The object of it was to prevent the Gas Company and the Contractor from



so conducting excavations for a gasholder as to cause a nuisance to the plaintiffs, and to be dangerous to the property by letting it down. The plaintiffs were the proprietors of the Cliff End Mill Dye-Works, and the defendants held adjoining property. Both the properties were held under the same landlord, and under leases dated on the same day; the plaintiffs being prior to the defendants, in which mention was made of the plaintiffs lease. The landlord granted to the plaintiffs a right of road along an occupation road to Cliff End Mills, along which all goods were taken to and from the station, and which road formed the direct road from Huddersfield. In July, 1876, the defendants began to make excavations for the purpose of erecting a large gasholder. They began to blast, and, as the plaintiffs alleged, large stones were hurled upon their premises, and this was repeated from time to time. When the stones came upon the plaintiffs property, the defendants said they did not believe it, and put the plaintiffs to very serious and considerable cost in the way of evidence, besides endangering the lives of their workpeople. The learned counsel read several affidavits, and produced several photographs, to prove the case which the plaintiffs alleged, amongst which was a statement that, owing to the defendants operations, the road to the defendants works had been let down. It was admitted the plaintiffs cause of complaint had been removed, and the question now resolved itself into a question of costs, which depended upon whether the plaintiffs were justified when they commenced proceedings, because the defendants had now erected the new holder for which the excavations complained of had been made. The only other point in the case was the damage alleged to have been caused by the pollution of the water in the adjoining brook.

The learned counsel for the plaintiffs had not concluded the reading of the evidence when the Court rose, and the case was adjourned until the 1st of April.

MONDAY, MARCH 25.  
(Before Vice-Chancellor BACON.)  
HAGG V. DARLEY.

This action came before the Court by way of demurrer to a part of the plaintiffs statement of claim. The action was brought to restrain the defendants from carrying on business under the name of the "Old Government Sanitary Company," and also "from carrying on alone, or in connection with any other person or persons, the trade or business of a manufacturer or seller of the Government carbolic disinfectants, or any other articles or things of a disinfectant nature or quality, or used for such purpose, or which was manufactured, sold, or traded in by the Government Sanitary Company, or the defendant and his partners, prior to the 3rd of February, 1877." It was to this part of the relief prayed that the defendant demurred, on the ground that the restraint sought to be imposed was unreasonable, and such as was not allowed by law.

Mr. RIBTON, who appeared in support of the demurrer, stated that on Jan. 4, 1877, it was agreed that the business carried on by the defendant should be sold to the plaintiff, and that the defendant should initiate the plaintiff into the secrets of the manufacture of the various articles. On Feb. 3, 1877, it was agreed that the defendant would not within 14 years from the date thereof buy or sell, or carry on, the said trade or business of a manufacturer or seller of carbolic disinfectants, and that the plaintiff for the like period would not disclose, either directly or indirectly, the nature or secret of the said manufacture to any person whatsoever. The plaintiffs had obtained an order upon motion made a short time back restraining the defendant in the terms of the prayer, and that order, as he submitted, prevented the defendant from carrying on any business whatever. He contended that the sale was only a sale of the goodwill of the business, and not of the exclusive use of the secret; and that being so, any covenant in restraint of trade must be reasonable.

Mr. HEMMING, Q.C. (Mr. RENSHEW with him), appeared in support of the statement of claim, and submitted that the demurrer ought to be overruled on the ground that the defendant had demurred and pleaded to the same subject matter.

The VICE-CHANCELLOR considered the defendant should have applied for the leave of the Court to demur, having pleaded; but this he had not done. Still he did not think it necessary to decide the case upon such a technical point, because the rest of the case was too plain to admit of doubt. In his opinion the agreement between the parties was not unreasonable in its terms, and did not restrain the defendant from carrying on any business he pleased, as long as he did not sell those articles which he had agreed not to sell. The demurrer would be overruled.

SATURDAY, MARCH 23.  
(Before the MASTER of the ROLLS.)  
HUNT V. STEVENS.

Mr. CHITTY, Q.C., and Mr. MAIDLOW were for the plaintiffs; Mr. INCE, Q.C., and Mr. LAING for the defendants.

This was a motion for an injunction to restrain the defendants from infringing the plaintiffs copyright in two designs for a gas chandelier and brackets, which they had registered under the Copyright Designs Act, 1842, and it raised a question of considerable importance to the trade, whether the plaintiffs, by what they had done, and which is no doubt a common practice, had lost the benefit of their registration. The 4th section of the above Act provides "that no person shall be entitled to the benefit of the Act with regard to any design, unless such design has, before publication thereof, been registered according to the Act, and unless, after publication of such design, every article of manufacture hath thereon the letters 'Rd.', together with such number or letter, or number and letter, and in such form as shall correspond with the date of the registration of such design according to the Registry of Designs in that behalf." It appeared that the plaintiffs firm, on new designs being made, had been in the habit of handing the original models to their travellers, while the drawings and registration were in progress, for the purpose of obtaining orders to be executed as soon as the registration should be complete. The designs in question were of a gas chandelier with seven brackets, the design for the brackets being protected by prior registration, and it was admitted by the plaintiffs that the above practice had been followed as to both designs. The chandelier had been sent up to some customers of theirs at the request of their traveller for the purpose of exhibition; had been forwarded as a sample to the defendants, who, not knowing of the alleged copyright, had kept it, and subsequently copied it. It also appeared that one of the brackets was not stamped as required by the above section. The defendants contended that their copyright in the design was bad, on the ground of prior publication, and that each article was not marked as required by the above section.

The MASTER of the ROLLS said that the plaintiffs practice had not been in accordance with the Act. The exhibition of a design for the purpose of sale to the very persons interested in knowing about it, in his opinion clearly constituted a "publication" within the section, and, therefore, the copyright in both designs was bad. As to the second objection, the section required certain letters to be printed on each design, and, if that were not done, in his opinion it was as equally fatal to the copyright as prior publication. It was no doubt hard that where a manufacturer

endeavoured to comply with the Act, and by some accident omitted to mark some article, he should lose the benefit of his registration; but that was at present unfortunately the law, and he had no power under the Act to relieve a person from the penalty. He certainly considered that there ought to be some such power of relief, and that the Act required amendment in that respect. He could, therefore, make no order on the plaintiffs motion. The costs would be costs in the action.

FRIDAY, MARCH 29.

ATTORNEY-GENERAL V. LOCAL BOARD OF WALTHAMSTOW.

Mr. MARTEN, Q.C., moved, on behalf of the plaintiff, that a sequestration might issue against the Local Board for not having complied with the order of the Court. An injunction was granted on the 29th of July, 1875, to restrain the Local Board from discharging sewage or other foul matter into the Filey Brook or Leyton Level so as to create a nuisance to the public, the injunction not to be enforced for a period of 18 months. The period of suspension expired on the 29th of January, 1877, and on the 18th of May the time was further extended till the first day of sittings in Michaelmas term, the Court then stating that it would expect the Local Board to use due diligence in the matter, in consideration of the indulgence then given. The Local Board having virtually done nothing in the matter, he had to ask that the sequestration might issue.

Mr. INCE, Q.C., who appeared for the Local Board, said they had that morning filed an affidavit showing what had been done, and he had to ask that the injunction might be further suspended for 18 months. They had had to buy an estate on which to put the sewage, and that purchase had not been completed until December, 1877. They had received the sanction of the Local Government Board to their borrowing £14,000 to complete the purchase, and they had now accepted tenders for the works, which would be commenced forthwith.

The MASTER of the ROLLS said he would extend the time till the first day in July, the defendants paying the costs of the present motion. He could not conceal from himself that the Local Board had been very slow in their movements.

Mr. MARTEN asked that the costs might be given as between solicitor and client, believing that if that were done it would make a greater impression upon the ratepayers, and they would bestir themselves in the matter. He believed that course had been taken in the *Merthyr Tydfil* case.

The MASTER of the ROLLS said he would give the costs as between solicitor and client. If the defendants had been individuals instead of a corporation, they would have been sent to prison long ago. Still, the powers of the Court were large, and the Corporation might find that out to their cost. The time would be extended till the first motion day in July.

THURSDAY AND FRIDAY, MARCH 28 AND 29.  
(Before Justice FRY.)

FLOWERS V. LOW LEYTON LOCAL BOARD.

Mr. KEKEWICH and Mr. SHEPPARD appeared for the plaintiff; Mr. FORD NORTH and Mr. GIFFARD for the defendants.

In this case the plaintiff was the lessee and occupier of a farm called Forest Farm, situated at Low Leyton, Essex. Outside his farm was an open ditch, being one of the sewers under the control of the defendants. Into this a large quantity of sewage was poured, which, at times, as the plaintiff alleged, overflowed one of his fields, and thereby he sustained considerable damage. It was admitted that since the commencement of the action the discharge of sewage had ceased. The plaintiff, therefore, did not ask for an injunction to restrain that which had been done, but for damages and costs. The defendants said the plaintiff could not sustain the action, because he had not given the proper notice under the 264th section of the Public Health Act; that since the formation of the Local Board, in 1873, they had been active in their endeavours to construct a complete system of drainage; that the ditch of which complaint was made had had sewage poured into it from time immemorial; and that if the plaintiff had raised his field 3 feet he could have obviated the flooding of which he complained.

Mr. J. T. Brassey, examined by Mr. KEKEWICH.

I am an architect and surveyor at Wanstead, and know the property in question, of which I made a plan in June, 1876. I now produce it, showing the drains and their position. I visited the land in June, 1876. The ditch was full of foul sewage, with a very sluggish flow. It was being discharged from a barrel drain. There were evidences of the field having been recently flooded with sewage; and the crop of peas and brocoli was destroyed.

Cross-examined by Mr. FORD NORTH: The ground was damp. I do not remember that the weather had been wet. I could see actual sewage matter on about two acres, and there were traces of it on the vegetation. I could not reduce the plaintiff's loss into money.

By the COURT: I think there is a general fall of the land towards the ditch. I think there was a defined line of poisoning to the crops.

Mr. W. Flowers, examined by Mr. KEKEWICH.

I am the plaintiff. I have occupied my land eight years. I have 36 acres. The land is principally clay. It grows almost anything. I sowed the field in question with peas. The ditch when I first knew it had not much sewage running through it from a drain at each end. It had much increased, until it was stopped about fifteen months ago. The sewage in the ditch used to overflow on to my field, and damaged my crops. In 1876 I had to plough up the part where the peas were. They came up, and then rotted away. I afterwards planted brocoli; but that failed, owing to the overflow of sewage, although in the other parts of the field there was a very good crop. There was another overflow the next winter. I sometimes had as much as half an inch of deposit on my land and plants. It injures crops, and produces weeds in great quantities. I consider I have been injured to the extent of £75.

Cross-examined by Mr. FORD NORTH: I know Mr. Ashbee, the Surveyor to the Local Board. I complained to him of the overflow about five years since. I do not know whether it was before or after the formation of the Local Board. Mr. Ashbee promised to have the ditch cleaned out; and later on he said the new sewerage works would take the overflow away. That would be about three or four years ago. I said I should be satisfied if they compensated me for the injury. The Board declined to compensate me. Sewage irrigation may do good when the sewage can easily be got rid of, but not when it remains for months on the ground.

Charles Littlechild, examined by Mr. KEKEWICH.

I have been cowkeeper at Leyton 28 years. I know the field in question, and the ditch at one side of it. Some years ago there was only a very little sewage in it; but much building has taken place in the last twelve years, and the sewage has greatly increased. Within the last four or five years, I have known the ditch overflow on to the land, but not since the new sewer was put in, within the last 14 or 15 months. The crops of the former occupier of the farm were not injured by any overflow from the ditch.

Cross-examined by Mr. FORD NORTH: I never knew the ditch overflow until within the last four or five years. The rain and sewage caused the overflow.



*George Floyd, examined by Mr. KEKEWICH.*

I am a farmer at Low Leyton. I have known the land in question 20 years. I bought a crop of brocoli in August, 1876, but it got flooded and rotted.

Cross-examined by Mr. FORD NORTH: I sold the brocoli, and made a little profit.

This closed the plaintiff's case, and the defendants—the Local Board—called their witnesses.

*Mr. Alfred Ashbee, examined by Mr. GIFFARD.*

I am Surveyor to the Leyton Local Board. I have known the parish ten years, and know the field the subject of the action. The main system of sewers was commenced in the spring of 1876, and the portion to relieve the field in the autumn of that year. The works were quite effectual to relieve the field from overflow.

Cross-examined by Mr. KEKEWICH: When I saw Mr. Flowers, I said what he complained of would be speedily remedied. The contract to drain the ditch was not then made, nor, indeed, until after the action was commenced.

His LORDSHIP, after hearing Counsel upon the evidence, was of opinion that the plaintiff had made out a case of damage, and assessed it at £50, the defendants to pay the costs of the action.

## Miscellaneous News.

### CAGLIARI GAS AND WATER COMPANY, LIMITED.

The Ordinary General Meeting of Shareholders was held at the London Offices of the Company, No. 3, Lothbury, on Tuesday, the 26th of March—Professor ERASMUS WILSON, F.R.S., in the chair.

The SECRETARY (Mr. Rod. Mackay) having read the advertisement convening the meeting, the following report and accounts were submitted:—

The receipts on revenue account for the past year amount to £17,563 0s. 6d., and the expenditure to £8312 12s. 8d., leaving a clear net revenue for the year of £9250 7s. 10d. The amount available for dividend, including the balance brought forward from the previous year, as shown on the balance-sheet, is

Out of which an interim dividend at the rate of 5 per cent. per annum was paid for the half year ending June 30, 1877	£3,611 10 0
The Directors recommend a dividend at the rate of 7 per cent. per annum for the half year ending Dec. 31, 1877, amounting to.	5,069 8 0
	8,680 18 0

Leaving a balance to be carried forward to next year's account of £2,378 3 5

The water receipts for the year show an increase of £474 over those of the previous year.

The gas receipts, from public and private lights, for the year show an increase of £292. The products show a decrease of £224, owing to the lower prices obtained. The expenditure on coal for the year shows a corresponding decrease.

The expenditure for maintenance of the water-works shows a slight increase for the past year, owing to the cost of some permanent improvements being charged thereto.

The loss from gas leakage has averaged 10 per cent. of the make over the whole year. The amount paid for rates and taxes in Cagliari during the year, and the loss of exchange on remittances to this country, still continue to press somewhat heavily on the Company.

The Directors retiring by rotation are Mr. John Aird and Mr. Frederick Wigan, who, being eligible, offer themselves for re-election.

Dr.	Revenue Account, for the Year ending Dec. 31, 1877.	Cr.
Maintenance of water-works—		
Reservoirs and filters in Corungio . . . . .	£107 6 5	
Main to town . . . . .	62 15 5	
Reservoirs and mains in Cagliari . . . . .	164 3 11	
Horse keep & miscellaneous . . . . .	150 4 9	
Gas manufacture—		
Wages . . . . .	698 15 2	
Coals . . . . .	1,685 7 10	
Stores . . . . .	371 2 0	
General charges in Cagliari—		
Salaries . . . . .	1,252 15 11	
Office rent, stationery, travelling expenses, &c. . . . .	242 4 2	
Rates and taxes in Cagliari . . . . .	969 16 3	
General charges in London—		
Directors and Auditors fees . . . . .	281 10 0	
Salaries and office rent . . . . .	250 0 0	
Stationery, bill stamps, and petty disbursements . . . . .	41 5 6	
Prem. on insurance of works . . . . .	30 0 0	
Exchange on remittances . . . . .	1,267 14 9	
Interest and discounts . . . . .	484 10 7	
Sinking-fund . . . . .	150 0 0	
Reserve-fund . . . . .	100 0 0	
Balance—net profit for year carried to gen. balance sheet	9,250 7 10	
	£17,563 0 6	£17,563 0 6

### Capital Account and Balance-Sheet.

Dr.	Cr.
Gas and Water-Works—	
Total amount expended, including preliminary expenses, to Dec. 31, 1876, per last account . . . . .	£151,170 7 11
Expended during year . . . . .	857 10 7
Cash at Company's bankers, London . . . . .	65 18 2
Cash at Cagliari . . . . .	67 7 1
Sundry debts due to the Company . . . . .	6,374 12 0
Special works executed . . . . .	1,942 18 1
Stores on hand at Cagliari—	
Coals . . . . .	72 16 0
Products . . . . .	179 10 9
Goods . . . . .	500 0 0
Goods in transit . . . . .	523 4 3
Investment in share capital of Company (sinking-fund) . . . . .	2,080 0 0
Do. do. (special reserve-fund) . . . . .	300 0 0
Payment on account of dividend, Oct. 8, 1877 . . . . .	3,611 10 0
	£167,745 14 10
Capital, authorized by Memorandum and Articles of Association, 7500 shares of £20 each . . . . .	£150,000 0 0
7242 shares, subscribed to Dec. 31, 1877 . . . . .	144,840 0 0
Debiture bonds . . . . .	7,500 0 0
Sundry debts due by Company . . . . .	1,449 17 5
Bills payable . . . . .	283 16 4
Sinking-fund . . . . .	2,096 2 8
Special reserve-fund . . . . .	311 17 0
Revenue account, net profits—	
Balance, Dec. 31, 1876 . . . . .	£10,661 5 7
Less divs. paid for year 1876, 8,652 12 0 . . . . .	2,008 13 7
Year to Dec. 31, 1877 . . . . .	9,250 7 10
	£167,745 14 10

The CHAIRMAN, in moving the adoption of the report and accounts, said: Gentlemen, there is always a disadvantage in a Company appearing to be too flourishing. Such a state is calculated to excite envy, and to give rise to various questions in connection with it. I am, therefore, happy to say that our Company is a thriving Company, but is not remarkable for its prodigious success. We are moving on steadily, quietly, and easily in a groove which seems to present very little variation from time to time. If you look to the report before you, I will read and compare the figures which occur in the first paragraph of last year's report compared with this year's. "The receipts on revenue account for the past year were £17,434, the expenditure was £8161, and the clear net revenue is £9273,"

almost, as you will observe, identically the same figures. But, nevertheless, the present year shows we have had a year of labour, and shows also the reward of that labour. There are vicissitudes represented which we know to exist among all Gas Companies, in consequence of the price of coal, on the one hand, and the price of products on the other, and circumstances of that kind; but these form the only variety in our account this year as compared with last year. In so small a place as Cagliari, and in so small a Company, we cannot expect any very considerable increase; but, nevertheless, I am happy to be able to report that, in the water department, there is an increase of £474 over last year, and in the gas department there is an increase of £292. Moreover, the expenditure for coal was diminished during last year, but the products, as has been the case in this country as well as in Italy, show a decrease, and a somewhat considerable decrease, looking at the total revenue of the Company. The expenditure for maintenance of the water-works is one which is calculated to give stability to the tanks, apparatus, and plant connected with the supply of water to the town. The rate of leakage has increased as compared with last year, but still so little that we cannot make any special objection to it. The next paragraph relating to the rates and taxes in Cagliari, and the loss of exchange on remittances, is one over which we have no control. Being, to a certain extent, a foreign company, we must necessarily submit to the laws and customs of those whom we represent; but, taking the whole together, I think we have every reason to be satisfied, and I feel that we are going on smoothly and quietly, and that we may consider ourselves successful, although there is no such brilliancy of success that we have any fear of making a large fortune in a very short space of time. Appended to the report is, as you will see, the ordinary balance-sheet, with reference to which we shall be happy to answer any question which any Shareholder may be pleased to put; but at this time I will only ask you to accept the balance-sheet as read, and I will now propose—"That the report and accounts for the year ending Dec. 31, 1877, be, and they are hereby, approved and adopted."

Mr. JOHN AIRD, a Director, in seconding the resolution, said he could bear out the remarks which the Chairman had made on the report. He hoped the Shareholders would think as the Board had thought—that the result of the working of the Company for the past few years confirmed the opinion they had had as to the genuine merits and character of the enterprise in which they were associated. In addition to this, the Board felt the greatest satisfaction in knowing that, not only had they done that which had produced a fair return for the Shareholders, but they were also conscious that they had given to the authorities at Cagliari the greatest satisfaction by the way in which the works at Cagliari had been carried out, both as regarded the water supply and the gas supply, by the working representative of the Company there, Mr. Simmekjor.

The resolution was carried unanimously.

The CHAIRMAN moved—"That the interim payment on account of the dividend on the 9th of October last be, and is hereby, confirmed; and that the dividend for the half year to the 31st of December, 1877, at the rate of 7 per cent. per annum, less income-tax, be declared payable on and after the 8th of April, 1878."

Mr. FREDERICK WIGAN seconded the resolution, which was carried unanimously.

On the motion of Mr. H. P. STEPHENSON, seconded by Mr. R. KING, the retiring Directors, Messrs. Aird and Wigan, were re-elected.

Mr. H. P. STEPHENSON proposed a vote of thanks to the Chairman and Directors. He thought that the balance-sheet presented on this occasion was a very sound one, and, although the Shareholders had only a six per cent. dividend, they ought to propose to the Directors more than "six per cent. of thanks," because the Shareholders had hopes in the future.

Mr. HERSEY seconded the proposition, which was carried unanimously.

The CHAIRMAN, in reply, said he was sure that the Directors were very much indebted to the Shareholders for the confidence which they reposed in them, and also that they could feel that they had been guided by caution in not increasing the dividend at the present time. They would not omit any occasion which might present itself, and they would be glad, as early as possible, to increase the dividend. There was every prospect of this; but, in the meantime, they found that the portion of revenue which remained in their hands was useful, and calculated to tend to the best interests of the Company. They would, as they had done heretofore, give their best attention to the business of the Company, and they hoped their progress would be continued, although it must necessarily be gradual.

The meeting then separated.

### METROPOLIS GAS SUPPLY.

PUBLIC LIGHTING IN THE CITY OF LONDON.—The Report for 1877 of the Engineer and Surveyor to the Commission of Sewers (Mr. W. Haywood) states that tenders were received from The Gaslight and Coke Company for lighting the public lamps; the prices were £4 13s. 3d. per annum for lamps of a square shape, consuming 5 cubic feet of gas per hour, and £4 17s. 6d. for lamps of a circular shape. Those prices were lower than those in 1876. The number of defective lights observed during the year was 1089. The lanterns were cleaned twice a week with regularity. The contract quantity of gas was given at all lamps, and the regulators had been kept in proper condition. The Commission had desired to ascertain whether arrangements could be made with the Company for lighting the whole of the public lamps in the City on the occasion of dense fogs. The Company were communicated with, and replied that there would be great difficulty in providing the staff necessary for the sudden contingency, the lamp-lighters being, during the day, scattered all over London, engaged in other avocations, and, therefore, that it would not be possible to rally them, occasionally only, in time to be of use to the public.

LIGHTING PUBLIC LAMPS BY ELECTRICITY.—The *American Plumber* says: "Providence, R. I., has the credit of first lighting street-lamps by electricity. Within a certain district over nine miles in length, in less than 15 seconds, 220 lamps, by the action of one man, are lighted or extinguished. By the extension of the system throughout the city, a saving of 25,000 dols. a year is expected."

THE OLD HAMPSHIRE WATER-WORKS.—A correspondent writing to a contemporary says, "Within the last few days a relic of Hampstead, as it was in the olden time, has disappeared: I refer to the ancient fountain in the Conduit Fields. This fountain is (or was) of some little celebrity. Some 70 or 80 years ago Lord Loughborough, afterwards Earl of Rosslyn, resided at Hampstead. In the fields, only a few yards to the west of his lordship's house, was this small fountain, which welled out of the sandy soil and supplied most of the inhabitants of Hampstead with pure and clear water down to a very recent date. Indeed, only a quarter of a century ago, the water from this fountain was offered in glasses to the passer-by for a penny or a halfpenny. The conduit and the spring are now all but wholly dry; yet at Hampstead it is not forgotten how Lord Loughborough once endeavoured to stop up the footpath which led to it from the High Street, or how, although he sat upon the woolstack at the time, he was forced to concede the point which he had raised, and to leave the conduit stream open to all comers."



## METROPOLIS WATER SUPPLY.

## METROPOLIS WATER-WORKS (PURCHASE) BILL.

The Vestry of St. Pancras have published the following  
*Reasons against the Second Reading.*

The Bill is promoted by the Metropolitan Board of Works to authorize the compulsory purchase by the Board of the Companies supplying Water to the Metropolis, and to certain places in the neighbourhood, extending over a further area twice as large as the Metropolis.

The Metropolitan Board of Works are the authority, under the Metropolitan Management Acts, for main drainage, street improvement, and other works, but not for water supply, and are not "the governing body" of the Metropolis.

The government of the Metropolis is so arranged that a much larger proportion of the functions and authorities usually performed by Corporations in provincial towns are exercised by the Corporation of the City of London and the Vestries and District Boards, who elect the Metropolitan Board, than by that Board.

The Corporation of the City, and the majority of the Vestries and District Boards, are opposed to the Metropolitan Board seeking powers entirely outside those for which they have been elected, but are powerless to alter the representation at the Board, or to prevent proceedings, however clearly *ultra vires* (without recourse to legal proceedings), seeing that the representatives are elected for three years.

The Metropolitan Board of Works should not, in defiance of the opinions of their constituents, enter upon a scheme, the magnitude and importance of which the Board can only imperfectly comprehend, as witnessed by the promotion of another Bill, purposing, at an estimated cost of five-and-a-half millions of money, to introduce a second supply of water for special purposes, upon a plan which has been almost universally condemned.

The Board would, if this Bill is read a second time, be encouraged, by their partial success, to seek to extend their powers of taxation to an unknown extent. Sir J. W. Bazalgette and the other Engineers who are the advisers of the Board in this matter say in their Report:

"If the governing body of the Metropolis were, at a cost of from twenty to twenty-five millions of money, to acquire the existing Water Companies, it would find that this expenditure was *merely a first step in the outlay*, because the property purchased would be one wherein the bulk of the water would be drawn from sources against which the public protest, and thus the £25,000,000 would have to be supplemented by a further and perhaps an *almost equal outlay* to replace this water by other derived from purer sources, even if indeed it could be got at all."

The magnitude of the proposals of the Metropolitan Board, the special requirements, and the special government of London, place the Metropolis beyond comparison with the provincial towns where the water supply is in the hands of the Municipal Authorities.

There are only five out of the 278 parliamentary and municipal boroughs in England and Wales larger than St. Pancras, and these are the only towns which exceed in population the smallest district supplied by a separate Metropolitan Water Company. Only two of the Water Companies supply populations less than 300,000, and the two largest—the New River and East London—supply a district containing a population equal to that of the five largest towns in England; the New River Company alone supplying a population equal to that of Liverpool and Manchester united.

The area supplied by the eight Water Companies is about 40 times that of Liverpool or Manchester.

A scheme so gigantic should, if promoted at all, be promoted upon a clear and settled basis by the Imperial Government, and not hurriedly and upon imperfect data by a Board without any experience upon the question, and elected by the Vestries and District Boards for functions of an entirely different character.

The Vestries and District Boards, standing as they do between the Metropolitan Board and the Ratepayers, are not aware that the inhabitants of the Metropolis "protest against," or have reason to be dissatisfied with, the London Water Supply.

Between 1828 and the present time, numerous official reports have been made by Royal Commissions, Select Committees, and other public authorities, all tending to show that the present sources of supply are, if the water be properly filtered, as good as any others, and far more convenient. The Duke of Richmond's Commission said, "That the abundance, permanence, and regularity of supply, so important to a large Metropolis, are secured much more efficiently by the great extent and varied geological character of a large hydrographical basin, such as the Thames, than by the necessarily very much more limited collecting areas that can be made available on the gravitation system." Further, "That there is no evidence to lead us to believe that the water now supplied by the Companies is not generally good and wholesome."

Mr. Ayrton's Committee said in 1867: "We are satisfied that both the quantity and quality of the water supplied from the Thames are so far satisfactory, that there is no ground for disturbing the arrangements made under the Act of 1852, and that any attempt to do so would only end in entailing a waste of capital, and an unnecessary charge upon the owners and occupiers of property in the Metropolis."

It is questionable whether the new supply, proposed by the Metropolitan Board, for drinking purposes would be better than the present, whilst in some respects there is no doubt that it would be worse—setting aside the enormous cost of the experiment. The chalk water is harder than the Thames water, and on that ground quite as unpalatable and objectionable to health, and less efficient and economical for washing and manufacturing purposes. In the report of the General Board of Health, a report which immediately preceded the Water Act, 1852, passed for the purpose of improving the sources of supply it is advised not only that all schemes be rejected which adopt the Thames as its source of supply, but also "*wells and springs from the chalk or other formations which impart the quality of hardness.*" Moreover, the Rivers Pollution Commissioners, in their report describing chalk water, say, "The water entering the chalk is almost always to some extent polluted by animal matter before it leaves the surface. The pollution is slight if the rain falls upon the grassy slopes of a chalk down, it is more considerable when the rain soaks through highly manured soil, and it is greatest when the chalk is cut up and honeycombed by sewers and cesspools."

Since 1852 the Metropolitan Water Companies have not been allowed to take water from the Thames below Teddington Lock, or from any part of the tributary streams within the range of the tide. During the same period, the improvement in the sanitary laws, and the increasing powers of Sanitary Authorities, and especially the action of the Conservators of the Thames, have had a great effect in preventing the passing of sewerage or other offensive or injurious matter into the river above the intake of the Water Companies.

The sewerage of the 30 towns or sanitary districts along the valley of the Thames has been diverted during the past ten years, and in most cases the diversion has been effected by establishing works for sewage irrigation. Thus, whilst the present sources of supply have been gradually and naturally improving, the proposed new sources have, by the adoption of sewage irrigation systems, and the extension of the metropolitan suburbs, been at the same time rendered more suspicious.

With these facts in view, it is evident that the scheme of the Metropolitan Board would not ensure a better supply, either as regards quantity or quality. Moreover, the Water Companies are at present under the control of the Local Government Board, and the interests of the public are looked after by the constant examination of the water by Government Officers, and the public audit of the Companies accounts.

The President of the Local Government Board has already, during the present session, in answer to a deputation from the Vestries and District Boards, assured the public that if the Duke of Richmond's Commission and Mr. Ayrton's Committee could not, ten years ago, condemn the Companies, there is less reason for doing so now.

The Metropolitan Board allege that the present supply is insufficient for fire-extinguishing purposes, which requires a constant service at high pressure, in order that hydrants may be used instead of fire-engines.

The Select Committee on the Metropolitan Fire Brigade say: "These conditions are admitted to be realized with marked success in some provincial towns which possess special local advantages in respect of water supply, and which have had their pipeage laid down with a view to the use of water, not only for consumption, but for the extinction of fires."

In these towns, however (notably Liverpool, Manchester, and Brighton), fire-engines are not discontinued, but are used as well as hydrants by way of reserve. As the Select Committee further say: "The advocates of the hydrant system can appeal to what has been well called the axiom of fire extinction, that small means, promptly exerted, are more efficacious than more powerful applications at a later stage, such axiom depending on the obvious fact, that every fire begins by a small one, and can then be easily dealt with, whereas if unchecked it rapidly gains head, and before long becomes uncontrollable."

The Metropolitan Board have not availed themselves of the advantages which the present system affords, and which the experience of provincial towns dictates. The Metropolitan Water Act, 1871, made provisions for a constant water supply where suitable fittings existed, and the Companies have now a large number of their mains constantly charged, and urge their willingness to extend the constant supply system, as the use of suitable fittings is extended. Where, however, the mains are constantly charged, the Metropolitan Board persistently refused to fix hydrants until the Kent Water Company, under the provisions of the Act of 1871, fixed them on constant supply mains, and charged the Board with the cost. Since then the Board have requested the New River Company to fix hydrants in Northumberland Avenue, Great Eastern Street, and elsewhere, and may now be inclined to follow the example of the City Corporation, who have fixed nearly 200 hydrants in the City, and further extensions are contemplated, whilst the official reports of the Corporation state the results to be very satisfactory.

For the foregoing, amongst other reasons, it is urged that the Bill may not be allowed to be read a second time, for if it is, the Ratepayers and the Local Authorities, as well as the Water Companies, will be involved in a costly inquiry before a Committee, and the whole burden of this inquiry will ultimately fall upon the public, either as water consumers or as ratepayers.

(Signed) THOS. ECCLESTON GIBB, Vestry Clerk, St. Pancras.

## METROPOLITAN BOARD OF WORKS.

The Meeting of the Board was held on Friday last—Sir J. Hogg, M.P., in the chair.

Mr. RUNTZ had given notice that he would move the following:—"That the Bill now before Parliament, to empower the Board to provide a new supply of water for drinking and fire-extinguishing purposes, be withdrawn."

Upon the motion being called on,

The CHAIRMAN said: I have been in communication with Mr. Runtz on this subject, and I have asked him to postpone the discussion of it until after Easter. Mr. Runtz asked me to publicly state to the Board my views, my reasons, and my wishes, and I have the greatest possible pleasure in doing so. I ask him and the Board to postpone all discussion upon this matter, because I consider that it would be very prejudicial to the interests of the Board that any discussion whatever should take place upon it at the present moment. I also think that it is hardly fair to me personally that this discussion should take place at a time when I, as your Chairman and a Member of the House of Commons, have charge, not only of this, but other important Bills. The adjourned discussion upon the second reading of the Purchase Bill is to come on on Thursday next, and I do not think it is fair to me that a discussion upon Mr. Runtz's motion should take place previously. I may say—and I think you will agree with me—that I have no little labour in looking after the Bills of the Board in the House of Commons. I do not in any way grudge the labour or the time that I give, but I would point out to you that that labour and that time give the person who devotes them a considerable amount of experience; and I wish to place that experience at your disposal. I also request you, not only as a matter of justice to me, but as a matter of justice to yourselves and to your Board, not to let this motion be now discussed. And I say further—and I think almost every member of the Board will concur when I tell you—that no further legal expenses will be incurred at the present time, and that, as to the evidence, the investigation will be strictly limited to the completion of the reports to be made by the Engineers and others. No further witnesses will be instructed, and no new investigation will be commenced. I leave it in the hands of Mr. Runtz.

Mr. RUNTZ: The object I had in putting this motion on the paper was to get an expression of opinion from the Board. This Bill was introduced into Parliament upon the vote of a very small majority of the Board; and it is a very dangerous thing indeed—always a very dangerous thing—to introduce into Parliament a Bill under such circumstances. I thought the time had arrived, seeing the great expenditure incurred in the preparation of the evidence, to do something to stop that expense; but as you, sir, assure us that the expenditure is stopped, the main reason I had in putting this motion on the paper to-day is gone. It is, I believe, upon the understanding, not only that the legal expenses are stopped, but that the engineering and all other expenses are stopped, except for the purpose of collating evidence which has been already obtained, and making it of use. It must be distinctly understood that the chemical expenditure is stopped, that the engineering expenditure is stopped, and that the legal expenditure is stopped. That being so, I am quite willing, with the consent of the Board, to postpone the motion.

Mr. ROGERS, who was heard very imperfectly, was understood to say that he quite agreed with the views of Mr. Runtz, but he could not object to the proposition which had been placed before them by the Chairman. He accepted from the Chairman what he had said with regard to the expenditure, and he hoped it was intended that the large expenditure which the Board were incurring for borings for water would, like the other expenditure, be stopped. He was desirous not to render more difficult the onerous position of the Chairman's duties in Parliament.

Mr. WATKINS: I think that we ought to have a better understanding on this matter, and that, if the motion be withdrawn, we should have a resolution passed for preventing any further expenditure, for prosecuting evidence, and so on. (No, no.) If our honourable friend there intends



to stop discussion to-day, and prevent any member of the Board from giving expression to his opinion about the enormous expenditure that is going on now with reference to this Bill, then, sir, his withdrawal of the motion will not prevent my bringing this question forward on another occasion, and that occasion shall be next Friday, if I am prevented from speaking to-day. I think it ought to be clearly understood that every expenditure in connection with this Bill shall be at once stopped. We have had this matter before the Finance Committee, and we have been told there of the enormous expenditure that is now going on in endeavouring to collect evidence, and in other things with reference to this Supply Bill, which has been almost universally condemned throughout the Metropolis. Unless, therefore, not only the legal expenses, but every expense pertaining to that Bill is at once stopped, I shall think it is my duty to divide the Board to-day upon the question of withdrawing the motion.

Mr. LESLIE: There is one point which I think the members ought to know, and that is, that in a paper sent to me by the Board, there is a return to Parliament on the motion of some one with some outrageous name, and in this return it is shown that all the water that was used by the fire-engines in the year 1877 just equalled 80 minutes supply!—"Question"—and the expenses we have paid for it, at 1s. per 1000 gallons, do not come to £333. Why, sir, those who have this Supply Bill in hand have paid four or five times as much as that; and, if we let them go on, they will pay four or five times as much more. This return is one of the most important documents. I do not know whether any of the members have read it, but I have read it with the greatest possible care, and it touches upon our Bills. It touches the Supply Bill and it touches the Purchase Bill; because, if you believe Dr. Frankland, there never was such rubbishing stuff ever delivered to the public as these eight Water Companies are delivering. (A Voice: "Not all," and "Question.") The question is, sir, whether we are to take a simple statement. If the Chairman says that it shall be inserted on the minutes, I will sit down. If what he has said is inserted on the minutes as the reason for Mr. Runtz withdrawing his motion, I have no objection; but, sir, I think that it is quite right just to say that all the water supplied for fire-extinguishing purposes by the eight Companies during last year did not equal 80 minutes of the general supply by the Companies in any one day, whilst 66 miles of rivers, lakes, docks, and canals supplied by far the greatest quantity of water for fire-extinguishing purposes without any cost whatever. Sir, upon those large areas, which are 768 acres in extent, hydrants will be perfectly inadequate. I do not know, sir, whether you will agree that your statement shall appear on the minutes.

The CHAIRMAN: I have not the slightest objection to have every word that I have stated to my colleagues put upon the minutes. I am entirely at their disposal. I do not care the least about it. I have no objection to it, because I am not ashamed of anything that I have said. I leave it to my colleagues now to take their own course.

Mr. FOWLER: I am quite sure that every member of the Board will sympathize with the expression of feeling which the Chairman has given utterance to in respect to this question, and of his position as the representative of the Metropolitan Board in Parliament. But, while we sympathize with that, we have public duties of our own, and responsible duties to perform, of the responsibility of which we cannot divest ourselves. I should have been perfectly satisfied if the statement which the Chairman made had been a little more ample; but, as I understand, the undertaking put before the Board as a reason for Mr. Runtz not proceeding with his resolution to-day is this—that no new expense shall be incurred; that is to say, that there shall not be a new expense commenced. But I think that what we wanted was rather this—until there was an expression by the House of Commons that this Bill was one which should be more minutely considered, we should not carry out these boring works, and the getting up of evidence, and the work of the analysts, which are very expensive—that all that portion of the work should be stopped. That is the point with me. The merely legal expenses and the mere stopping of them, as those who know about this matter best can say, are a mere nothing at all; but it is the professional—the scientific evidence that is now being got together that will raise the great expense which we should like to see at once stopped. If that assurance is given, I shall most willingly and gladly fall in with the proposal to withdraw the motion.

The CHAIRMAN: I have stated already that all expenses shall be stopped with this exception, that as you have incurred a certain amount of expense, the further expense which will be incurred will be only such as is necessary to make that expense useful to you in the future. As to the question of analyses, those analyses will be stopped entirely.

Mr. FREEMAN: I regret very much that this motion should be withdrawn, and for this reason: I dislike playing with any great public question, and it looks to me very much like playing and trifling with it. I say distinctly that I think so, and I should greatly have preferred fighting our battle at once, and having the whole question decided, Yes or No, rather than going on in this temporizing manner. That is my judgment upon it, and I think that it would have been wiser to take and decide the question, Yes or No.

Mr. ROCHE: The Chairman has a certain duty to perform in the House of Commons in moving the Purchase Bill, and I do not believe that any member of this Board would desire that a single step should be taken previously to the Chairman moving the second reading of the Purchase Bill, which will be made use of as an argument against it. I do not think any one would desire that, and it was with a view that no discussion should take place, which would enable such a course to be adopted, it was desirable that some concession should be made on all hands in order that the Chairman may be placed in his proper position in moving the second reading of the Bill. That being so, I trust that the motion will be permitted to be withdrawn.

A vote was taken on the question of withdrawal, and the proposition was agreed to *nem. con.*

The CHAIRMAN: I thank my colleagues for the kindly consideration they have given me.

PUBLIC MEETING IN LAMBETH.—On Monday evening, the 25th ult., a public meeting of the inhabitants of Lambeth took place at the Vestry Hall, to protest against the proposals of the Metropolitan Board with respect to the future water supply of the Metropolis. Mr. William Burrup presided, and it was unanimously resolved—"That this meeting protests against the schemes of the Metropolitan Board of Works for the purchase of the existing Water Companies and the furtherance of a dual supply, believing that the advantages held out are too shadowy and unreal, while the increase of the rates will be inevitable, but the supply will be neither larger nor purer, or supplied at a cheaper rate, than at present." It was also further resolved—"That the ratepayers of the parish of Lambeth, assembled in public meeting, desire to memorialize Her Majesty's Government on the subject of the Water Bills now being promoted by the Metropolitan Board of Works, and to urge upon them the expediency of active opposition to the proposed Bills, believing that, so far as the interests of the ratepayers are concerned, the more the schemes are examined, the less desirable and practicable they will be found to be."

POPULAR DISTRICT BOARD.—At the meeting on the 26th ult., the following motion was submitted, and the consideration of it adjourned after some discussion:—"That, considering the improved quality and increased quantity of water supplied to the Metropolis by the various existing Water Companies, the two Bills promoted by the Metropolitan Board now before Parliament are inexpedient, and will tend to interfere with the private trading interests of the country, without conferring any adequate return to the ratepayers of the Metropolis, and, therefore, this Board requests the Metropolitan Board to withdraw the Bills."

WATER SUPPLY IN THE CITY OF LONDON.—Mr. W. Haywood, in his Report to the Commissioners of Sewers for 1877, states that during last year the amount paid by the Commission for public purposes was £1663. About 200 fire hydrants were fixed by the Corporation in various parts of the City. Towards the cost of those in the main thoroughfares the Commission will contribute, the hydrants in those streets being arranged so as to be suitable for street-washing. Other hydrants are in course of being fixed, and the system is to be extended to the whole City.

The following are the returns of the Society of Medical Officers of Health, on the Composition and Quality of the Metropolitan Waters in March, 1878:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen/Nitro- required gen. by Organic A. N. Matter, trates &c. &c.		Ammonia.		Hardness (Clark's Scale).	
				Sa- line.	Or- ganic.	Before Boil- ing.	After Boil- ing.
<i>Thames Water Companies.</i>							
Grand Junction . . . . .	21.20	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
West Middlesex . . . . .	21.10	0.051	0.120	0.000	0.007	13.7	3.3
Southwark and Vauxhall . . . . .	20.90	0.062	0.105	0.000	0.008	13.7	3.7
Chelsea . . . . .	20.90	0.061	0.120	0.000	0.011	13.2	3.3
Lambeth . . . . .	20.90	0.048	0.120	0.000	0.010	13.7	2.8
	22.20	0.062	0.114	0.000	0.011	13.7	
<i>Other Companies.</i>							
Kent . . . . .	26.40	0.000	0.195	0.000	0.002	17.0	4.6
New River . . . . .	20.20	0.024	0.134	0.000	0.007	13.7	2.8
East London . . . . .	22.10	0.032	0.105	0.000	0.007	14.3	4.2

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases.

C. MEYMOTT TIDY, M.B.

#### DR. FRANKLAND'S ANALYSIS OF METROPOLITAN WATERS FOR 1877.

The following is the "return to an order of the Honourable the House of Commons, dated the 6th of March, 1878, for copy of Report on the Analysis of the Waters supplied by the Metropolitan Water Companies during the year 1877, by Professor Frankland, D.C.L., F.R.S., &c."

Royal College of Chemistry, South Kensington Museum,  
Feb. 18, 1878.

Sir,—I have to submit to you, in the accompanying tabular statements, the results of the chemical examination of the water supplied to the inner, and portions of the outer, circle of the Metropolis, during the year 1877.

London was supplied during this year by eight Companies, with an average daily volume of 120,864,496 gallons of water. Of this, 60,862,201 gallons were sometimes much polluted with sewage matters; 52,771,302 gallons were occasionally so polluted, but to a much less degree; whilst 7,230,993 gallons were of unexceptionable quality.

The temperature of each sample at the time of collection, and its appearance in a 2-foot tube, have been recorded, and in all cases of turbidity a microscopic examination of the sediment deposited by the water on standing has been made.

Table A\* gives the temperature of the water as it flowed from the main at the time of collection. Classifying the waters into three groups, according to their sources, the following variations of temperature were observed:—

The temperature of the Thames water supplied by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies, varied from 6.3° C. (43.3° Fahr.) in March, to 20.0° C. (68.0° Fahr.) in August. At the higher temperature the water was rapid and unpalatable.

That of the Lea water delivered by the New River and East London Companies ranged from 5.5° C. (41.9° Fahr.) in March to 19.8° C. (67.6° Fahr.) in August, when this water was also repulsive to the palate.

The Kent and Colne Valley Companies deep-well water showed a minimum temperature of 7.2° C. (45.0° Fahr.) in March, and a maximum of 14.4° C. (57.9° Fahr.) in July. The temperature of this water was never high enough to render it unpalatable. I have been unable to obtain any trustworthy observations of the temperature of the deep-well water supplied by the Tottenham Local Board.

Thus it will be seen that the temperature of the river waters varied according to the season, ranging through no less than 14.3° C. (25.7° Fahr.).

The range of temperature in the deep-well waters was much smaller, and extended through only 7.2° C. (13.0° Fahr.).

Table B. shows the amount of solid matters contained in 100,000 parts by weight of water. This solid matter was composed of a great variety of substances, by far the largest proportion being entirely harmless when the water was used for dietetic purposes, but decidedly injurious when it was used for washing, because the water was thereby rendered hard.

A small proportion of the total solid matters consisted of organic substances. These are always objectionable, and, at times, when present in river water, they are dangerous to health. The average proportion of total solid matters in all three classes of waters, was nearly the same last year as in 1876, there being a very slight decrease in the Thames and Lea water, and a slight increase in the Kent Company's water. The highest proportion was found in the deep-well water, delivered by the Tottenham Local Board of Health, and the lowest is that supplied by the Colne Valley Water Company. Both these waters are derived from the same source; but the Colne Valley Company's water is softened by Clark's process, whereby a very large proportion of its solid matters is removed.

Tables C and D exhibit the proportion of organic impurity actually present in the waters as represented by the two most important constituents of organic matter—carbon and nitrogen. The importance of these indications depends chiefly on the fact that the pollution of the Thames and Lea is, to a great extent, of animal origin. On the whole, the year 1877 was, like 1876, very favourable for the river waters. Nevertheless, in the months of January, April, and December, the Thames water was

\* This and the Tables subsequently referred to are not published with the return.—Ed. J. G. L.



delivered to consumers in such a polluted condition as to be utterly unfit for dietetic purposes.

Taking the mean proportion of organic impurity in the Thames water delivered in London in 1868 as 1000, I find that in subsequent years, 1877 included, the following proportions were present:—

Year.	Proportion of Organic Impurity Present in Thames Water as Delivered in London.
1868 . . . . .	1000
1869 . . . . .	1016
1870 . . . . .	795
1871 . . . . .	928
1872 . . . . .	1243
1873 . . . . .	917
1874 . . . . .	933
1875 . . . . .	1030
1876 . . . . .	903
1877 . . . . .	907

The improvement here exhibited in Thames water is to be attributed almost wholly to the more careful treatment of the water by the Companies, for if the comparison be made with that portion of the Thames water which was inefficiently treated during a great part of the year by the Southwark Company, the proportion of organic impurity for 1877 amounts to 1022.

The Lea water was, as usual, much better than that abstracted from the Thames; but in January this water was also unfit for domestic use. Taking, as before, the mean proportion of organic impurity in the Thames water supplied to London in 1868 as 1000, I find in that, and subsequent years, down to 1877 inclusive, the following proportions in the Lea water delivered by the New River and East London Companies:—

Year.	Proportion of Organic Impurity Present in Lea Water as Delivered in London.
1868 . . . . .	484
1869 . . . . .	618
1870 . . . . .	550
1871 . . . . .	604
1872 . . . . .	819
1873 . . . . .	693
1874 . . . . .	583
1875 . . . . .	751
1876 . . . . .	562
1877 . . . . .	596

Table E. Taking as unity, for the purposes of comparison, the amount of organic elements (organic carbon and organic nitrogen) found in the Kent Company's water during the nine years ending December, 1876, this table shows the maximum, minimum, and average proportions in each of the waters supplied during 1877 to be as follows:—

Sources.	Maximum.	Minimum.	Average.
Deep wells—			
Kent . . . . .	1.4	0.6	1.4
Colne Valley . . . . .	4.2	0.1	1.4
Tottenham . . . . .	1.4	0.2	0.5
River Lea—			
New River . . . . .	5.0	0.7	2.2
East London . . . . .	5.1	0.7	2.6
Thames—			
Chelsea . . . . .	7.0	1.9	3.9
West Middlesex . . . . .	6.0	1.2	3.4
Southwark . . . . .	8.0	1.5	4.2
Grand Junction . . . . .	6.9	1.4	3.6
Lambeth . . . . .	6.0	1.8	3.6

This table shows that, whilst all the river waters are, on the average, of a much lower quality than the deep-well water of the Kent and Colne Valley Companies, and the Tottenham Local Board, the degree of their impurity varies between wide limits.

The following table exhibits the maximum amount of organic pollution in Thames and Lea waters from 1868 to 1877 inclusive, the average of the samples from each source in the month of greatest pollution being taken for comparison:—

Maximum Amount of Organic Pollution.

THAMES.			LEA.		
Year.	Elements of Organic Matter in Parts per 100,000.	Month in which Maximum Pollution occurred.	Year.	Elements of Organic Matter in Parts per 100,000.	Month in which Maximum Pollution occurred.
1868	45	January.	1868	27	February.
1869	60	February.	1869	33	February.
1870	42	January.	1870	30	January.
1871	52	October.	1871	22	February.
1872	48	Jan. and Dec.	1872	39	December.
1873	46	January.	1873	33	January.
1874	37	March.	1874	21	March.
1875	49	November.	1875	28	November.
1876	44	December.	1876	24	March.
1877	49	January.	1877	30	January.

The improvement here exhibited in Thames water is to be attributed again, almost wholly, to the more careful treatment of the water by the Companies; for if the comparison be made with that portion of the Thames water which was distributed by the Southwark Company, the maximum amount of organic impurity is no less than 0.47 in January, 1877.

In reference to the proportions of organic elements in the foregoing tables, I quote the following opinion of the late Rivers Commissioners from their report on the Domestic Water Supply of Great Britain, p. 5: "We consider that potable water, which contains organic matter even only partially derived from animal sources, should not yield much more than 0.1 part of organic carbon in 100,000 parts of water."

As the organic elements mentioned in the foregoing table consisted chiefly of organic carbon, it will be seen that the maximum pollution in the Thames greatly exceeded this standard, whilst that of the Lea was also always considerably above it.

Of the waters supplied from the Thames, that delivered by the West Middlesex was the best, and that distributed by the Southwark Company the worst.

Of the water drawn from the Lea by the New River and East London Companies, that supplied by the former was the best.

The quality of the water drawn from deep wells by the Kent and Colne Valley Companies, and by the Tottenham Local Board of Health, was so excellent as to render comparison superfluous. It is very desirable, both in the interests of temperance and of public health, that this delicious water should, as soon as possible, be substituted for that portion of the Metropolitan supply which is drawn from polluted rivers. This spring water, of unsurpassed purity, palatability, and wholesomeness is everywhere abundant in the Thames basin. In dry seasons it constitutes the sole supply of the river, and, even after the most protracted drought, more than 350 million gallons of it flow over the weir at Teddington, whilst a further large volume of it joins the Thames lower down. Surely it cannot be beyond the powers of Parliament and Engineers to collect and preserve from irretrievable sewage pollution a small fraction of this prodigal supply, and to distribute it to those portions of London which at present drink it after it has been mixed with the sewage of more than half a million of people.

Tables F and G\* need no comment.

Table H shows the total weight of combined nitrogen, and this, after making a small correction for that present in average rain water, constitutes the total evidence both of past and present pollution by nitrogenous organic matter. During the spring and summer months, the combined nitrogen in river water is much diminished by the abundant animal and vegetable life then existing in the streams; and, consequently, as an indication of pollution, the combined nitrogen found during the autumn and winter months only should receive consideration. During the months of January, February, March, October, November, and December, 1876, the average proportion of total combined nitrogen in 100,000 parts of Thames water was 0.312 part; in the same period of 1877 it was 0.291 part.

In the same quantity of water derived from the Lea it was 0.294 part in 1876, and 0.277 part in 1877.

The deep-well water supplied by the Kent Company is unaffected by animal or vegetable life, and the average may therefore be taken on the whole year. In 1876 it was 0.423 part, and in 1877, 0.501 part. Thus, the total combined nitrogen has slightly decreased in the river waters, and increased in the Kent Company's water; but in this case the increase is due to past, and not to present, pollution.

The evidence of previous sewage contamination in the Thames and Lea water continues without diminution. This evidence is of much significance in these waters, owing to the likelihood of morbid matter derived from animal excreta being carried down the stream and distributed to the customers of the respective Companies drawing their water from these sources.

Table I exhibits the quantity of chlorine found in the different samples; the results obtained prove that the tidal waters of the Thames and Lea had, in no case during 1877, obtained entrance to the reservoirs or filters of the Water Companies.

Table K shows the hardness of the samples analyzed, or the weight of carbonate of lime, or its equivalent of other soap-destroying substances, found in 100,000 parts of water. The average hardness of the Thames water was 19.8° or parts in 1876, and 19.5° or parts in 1877; of the Lea, 20.1° or parts in 1876, and 20.0° or parts in 1877; of the Kent Company's water, 26.8° or parts in 1876, and 27.5° or parts in 1877; of the water supplied by the Tottenham Local Board, 26.5° or parts in 1877; and of the Colne Valley Company's water, 5.1° or parts in 1877. The water of the last-named Company is softened by Clark's process before delivery, and thus rendered suitable for washing, whilst its excellence for dietetic purposes is not thereby impaired.

Lastly, Table L shows the annual average of each determination, thus summarizing the average results of analysis of the water supplied by each Company during the year.

The following table exhibits the results of my observations as to the degree of efficiency of filtration of Thames and Lea water distributed by the various Companies in 1877:—

Companies or Local Authorities.	Number of Occasions when Clear and Transparent.	Number of Occasions when Slightly Turbid.	Number of Occasions when Turbid.	Number of Occasions when Very Turbid.
Thames—				
Chelsea . . . . .	10	2	0	0
West Middlesex . . . . .	12	0	0	0
Southwark . . . . .	7	0	4	1
Grand Junction . . . . .	7	4	1	0
Lambeth . . . . .	8	4	0	0
Other sources—				
New River . . . . .	11	1	0	0
East London . . . . .	12	0	0	0
Kent . . . . .	12	0	0	0
Colne Valley . . . . .	10	1	1	0
Tottenham Board of Health . . . . .	11	1	0	0

The natural filtration which the Kent, Colne Valley, and Tottenham deep-well water undergoes through an enormous thickness of chalk, renders artificial filtration unnecessary, and is the cause of its almost uniform clearness and transparency.

This table shows that the West Middlesex and East London Companies only, out of the seven which supply river water to London, uniformly delivered the water in an efficiently filtered condition.

Since the year 1868, when I first instituted these observations, the filtration of the river water has undergone great and continuous improvement. Thus, during the year 1868, seven samples of water were very turbid when drawn from the mains; in 1869, six samples were very turbid; four in each of the years 1870 and 1871; in 1872 only one sample was very turbid; in 1873, none; in 1874 the Chelsea Company's water reached that degree of muddiness on two occasions; but since that date no sample was drawn in a very turbid condition from any main in the Metropolis until one was furnished by the Southwark Company during the past year.

When examined by the microscope, the sediment deposited by turbid water on standing is almost always found to contain numbers of living and moving organisms. During the year 1877, such organisms were observed in the Chelsea, Lambeth, and New River Companies water once, in the Southwark Company's water five times, and in the water of the Grand Junction Company three times.

\* These tables, we presume, give the quantities of Ammonia and of Nitrogen as Nitrates and Nitrites in 100,000 parts of the water.—*En. J. G. L.*



The annexed table exhibits the results of such microscopic examinations during the past nine years:—

Number of Occasions when Moving Organisms were Found.									
	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.
Chelsea . . . . .	3	2	2	3	2	5	4	4	1
West Middlesex . . . . .	0	0	0	0	0	0	0	0	0
Southwark . . . . .	8	1	4	1	2	5	7	7	5
Grand Junction . . . . .	4	1	1	2	3	5	5	3	3
Lambeth . . . . .	5	0	4	6	3	4	5	4	1
New River . . . . .	0	0	0	0	1	1	0	0	1
East London . . . . .	4	3	3	1	0	2	0	0	0
Kent . . . . .	0	0	0	0	0	0	0	0	0
Colne Valley . . . . .	—	—	—	—	—	—	—	—	0
Tottenham . . . . .	—	—	—	—	—	—	—	—	0

I am, &c., E. FRANKLAND.  
To the Right Hon. George Sclater-Booth, M.P., President of the Local Government Board.

LEICESTER NEW GAS-WORKS.  
[From the Leicester Daily Post.]

On Friday, March 22, the ceremony of laying the foundation stone of the new gas-works, at present in course of erection, took place. Owing to the very large increase of the town in late years, the wants of the inhabitants have exceeded the power of producing, and it became evident some time ago that further productive powers would have to be provided. With this view the Gas Company obtained parliamentary powers to erect new works upon a site on which they had fixed on the Aylestone Road. The site consists of 33½ acres of land, situated at a very convenient distance from the high road, from the railway, and from the canal, thus affording excellent means of communication, while the levels are such as are well calculated to render the supply of gas effective. It is proposed to erect two large tanks, each with a clear internal diameter of 172 feet 6 inches, and a depth of 36 to 37 feet in the deepest part, and a capacity of above a million and a half of cubic feet. The total depth of the excavations to contain these tanks and the apparatus underneath for drainage and other purposes will be 48 feet. In addition to these stupendous gasholders, either of which will be more than sufficient for the present wants of the town, there will, of course, be erected the necessary retorts and other buildings required for the manufacture of the gas. To make the excavations, it will be necessary to remove 80,000 cubic yards of soil, and the total cost of the works is estimated at £100,000, as they are at present intended to be erected; but powers have been obtained for £150,000, with a view to any contingencies which may arise. The contractors for this gigantic undertaking are the almost world-famous firm of Messrs. Lucas and Aird, who are well accustomed to the performance of works of this kind. The architects are the Leicester firm of Messrs. Shenton and Baker, and the engineers are Messrs. G. A. and C. S. Robinson, who have been for so long connected with the Leicester Gas Company, and whose family before them have conducted the business since its foundation. Mr. Lindley, of Braunstone Works, has contracted for the stonework, and the whole management of the works is under Mr. Charles J. Hall.

The ceremony on Friday afternoon was arranged to take place at half-past one o'clock, and shortly before that time a number of influential gentlemen of the town, who were specially invited to take part in the proceedings, arrived at the works in conveyances provided for the purpose. Amongst these were the Mayor (C. Stretton, Esq.), the ex-Mayor (W. Winterton, Esq.), W. E. Hutchinson, Esq. (Chairman of the Gas Company), &c., &c. These gentlemen and a number of others, conducted by the principal officers of the undertaking, walked round the works, and generally inspected them, so far as they have at present advanced. After having made a general survey and walked round the excavations, which have now been nearly completed, for one of the monster receivers, they proceeded to the spot where the ceremony was to take place. It had been arranged that the foundation stone should be of the tank which was first to be erected, and was thus necessarily at a depth of 48 feet below the surface of the ground. Of the whole circle, 172 feet 6 inches has been thus excavated, at a depth varying, according to the portion of the works to be erected, from 37 feet to 48 feet, and, to prevent the earth falling in, a most elaborate system of boarding and shoring had been arranged. The spot at which the stone was to be laid was selected at one of the wells, and, consequently, at the lowest depth; and, for the convenience of the visitors, a very carefully constructed stair was built, to enable them to descend easily and safely, while the greatest care was taken to prevent the beams and other shores from soiling the clothes. Having arrived at the place, the ceremony was at once proceeded with.

Mr. HUTCHINSON said, addressing the Mayor and assembled visitors, that it had been considered by a number of gentlemen of position and influence in the town, that the commencement of a large undertaking like the one they had come to see that morning, and especially as it was one which would have a very large influence upon the inhabitants of the town, should be inaugurated by some kind of ceremony, and so upon the present occasion the ceremony was to take the form of laying the foundation stone of one of the principal buildings of the works. He had been requested, as Chairman of the Company, to undertake the duty of laying the foundation stone of that large tank. They had already seen, in course of their peregrinations, that the works were upon a very extensive scale. The site which they were by their Act of Parliament allowed to appropriate, embraced an area of 33½ acres. He had a plan of the works before him, which plan showed those parts which were now in progress, and those which yet remained to be commenced, and to which he would direct their attention while he made some explanations. They would observe that the site was bounded in one direction by the embankment of the Midland Railway Company, the Directors of which Company had ordered the construction of certain sidings to the works, so that waggons would be able to come right up to the works without breaking bulk, and could be reloaded, if desirable, with the products of the works, to proceed in the contrary direction. But there were some products of the gas-works which would be more ready and conveniently conveyed by the canal, and for that purpose they had been empowered to take the small portion of land which lay between their works and the canal, so that there would be every convenience for conducting the water traffic. In the other direction they had the road, which was connected with the works by the excellent private road they had traversed that morning, and so they had complete communication with the town. The levels of the land were most suitable for supplying gas to the town of Leicester. The excavations had been commenced for two large gasholders and other houses, and had been nearly completed for one of the tanks—that in which they were then standing. These tanks were the largest that they had ever yet constructed. They thought they were doing great things in 1871, when at their old works they built a tank with a capacity of from 900,000 to 1,000,000

cubic feet. But the one in which they were standing would contain, when completed, 1,600,000 cubic feet. The sister tank was of like dimensions, and when it was completed it would contain a like quantity. At the present time it was not intended to do more than excavate the tank and build it up ready for the erection of the holder when the time should arrive that it would be required. The reason for undertaking this portion of the work now was that they were afraid if they did not do so the earth might bulge and so spoil both. They were there that day under rather peculiar circumstances. They were aware that an Act was now pending in Parliament for the transfer of the gas-works, and of the whole undertaking of the Company, to the Corporation and Town Council of Leicester, and although the works had been planned, and powers obtained by the Company, if the Bill passed into law after the 30th of June next the whole would become the property of the Town Council of Leicester. That being so, it became a matter of duty as well as of pleasure to invite to witness the ceremony the Mayor of the town and the Chief Chairmen of Committees, and the principal Officers of the Corporation, and on behalf of the Directors and Shareholders of the Company he begged to thank the Mayor and the members of the Corporation who were there present, for their courtesy and kindness in acceding to their request.

After a few congratulatory words from the Mayor, Mr. HUTCHINSON having received from Mr. Shenton, one of the Architects, a beautifully engraved silver trowel, proceeded, with the usual formalities, to lay the stone, amidst the cheers of the company assembled. At the close of the ceremony, the party were entertained at a *déjeuner à la fourchette* at the Company's offices. After the usual loyal toasts, the CHAIRMAN, in proposing "The Mayor and Town Council of Leicester," said the duties and responsibilities of the Corporation had now become exceedingly onerous, but he had the satisfaction of knowing that if the Bill which was being promoted in Parliament became law, he should leave the gas concern in the hands of their most able managers, the Messrs. Robinson. The works of the Company had been in the hands of those gentlemen or their relatives since the year 1823 down to the present time. Also they left available a staff of clerks and superintendents and work-people well trained to the business which they had to conduct. He had no doubt, therefore, that although the taking over of the gas-works, and also the water-works, would add very considerably to the business of the Council, they would discharge their duties ably and to the satisfaction of the town.

Amongst the toasts that followed, Mr. HUTCHINSON proposed the health of the founder of the feast, Mr. Aird, of the firm of contractors, Messrs. Lucas and Aird, who, he said, were celebrated for the undertaking of works of much greater magnitude than these. He hoped the work would be completed to his as well as to their satisfaction.

Mr. AIRD responded. He said he was sure his firm would feel greatly indebted to them for their kindness in this matter. He had taken up these works with the sincere desire of carrying them out in the manner they ought to be carried out, and he hoped it would be done to the entire satisfaction of all.

Alderman WINTERTON proposed the health of the Chairman in complimentary terms, in which he begged to say how much they were indebted to the kind and courteous way in which the Corporation had been met in the matter of taking over the works of which the Chairman had that morning laid the foundation stone.

Mr. HUTCHINSON responded, and thanked the company for the manner they had received Mr. Winterton's observations. He thought the negotiations which had been concluded would be a benefit to the Shareholders of the Company and to the Ratepayers of the Town. They had endeavoured so to demean themselves as not to give offence in any way, and where they had been obliged to differ they had differed in as amicable a manner as possible.

Alderman GRIMBLEY proposed the health of the Secretary (Mr. Billson), and of Messrs. Robinson (the Managers), and Mr. BILLSON, Mr. G. A. ROBINSON, and Mr. C. S. ROBINSON responded.

FLEXIBLE WATER-PIPES AT WAKEFIELD.—At the meeting of the Corporation of Wakefield, on the 12th inst., it was resolved, on the recommendation of the Water-Works Committee—"That the Secretary give notice by public placard within the water-works limits that from and after this date the use of the india-rubber, gutta-percha hose, and other flexible or moveable pipes for the use and conveyance of water supplied by the Corporation, will not be allowed, except where such water shall have passed through and been supplied by meter at the usual charges, and under the regulations made by the Corporation, and that no water will be supplied except by meter for fountains, and that persons infringing the said regulations will be proceeded against."

TOWN SEWAGE AND HOUSE DRAINAGE.—In a paper read before the Liverpool Engineering Society, on the 13th ult., by Mr. W. Kelly, C.E., the writer laid down the first principles which guide the Engineer in designing a system of drainage and sewerage, as being the area of the district to be included, its rainfall and physical outline, its population and probable future increase, and the water supply of the district. He pointed out that it may be safely assumed that, exclusive of spring and storm water, the ordinary water supply will pretty nearly represent the amount of sewage to be dealt with, but allowance must be made for the irregularity with which the ordinary sewage flows into the sewers, as a rule about half the total quantity flowing off in six out of the 24 hours. As regards provision for storm water, it had been proved by experience in London that the provision made for carrying off a quarter of an inch of rain flowing off the ground in 24 hours was found sufficient. The author declared himself in favour of the "egg shape" for the main brick-built sewers, as it was found that this form, with the narrow end downwards, promoted the most rapid flow of sewage water with the least deposit; the velocity required to carry off ordinary sewage appearing to be about 150 feet per minute.

NATIONAL WATER SUPPLY.—The following letter has been addressed by the Council of the Society of Arts to a select list of authorities, on the question of water supply:—"Sir,—I am directed by the Council of the Society of Arts to request the favour of your attention to the letter which His Royal Highness, President to the Society, has recently addressed to the Council. The Council desire to lay before His Royal Highness the opinions of the most eminent authorities on the subject of water, and on the practicability of giving to the people generally the benefit of those supplies which nature provides in so great an abundance. With this view, it is intended, some time in the month of May, to hold a congress for the discussion of the subject, as suggested in the letter of His Royal Highness. The Council would, in the first instance, venture to ask you to state briefly whether you believe a large and comprehensive scheme of a national character, as suggested, to be practicable. If so, I am to ask you to state, as briefly as convenient to you, the broad features of such a scheme. The Council hesitate to tax your kindness too much, but they would be gratified if you would, with a view to such a discussion, prepare a short sketch embodying your views, which might be printed, and which you might amplify by speaking at the meeting. Due notice of the day fixed for the congress will be sent you. In the meantime, the Council hope you will favour them with an early reply.—(Signed) P. Le Neve Foster, Secretary."



## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The exceptionally cold weather of the past fortnight has had a tendency to check the falling off in the demand for the better classes of round coal; but the season is too far advanced for this to have more than a temporary effect upon the market, and except that less stocks have been going down, there is no improvement to notice. Prices continue weak and irregular, with consumers pressing for reductions. Nominally, late rates are maintained, but there is a great deal of underselling going on in the market, and there is every indication of extremely low prices ruling during the summer. Good Wigan screened Arley at the pit mouth can be readily bought at 9s. per ton, and inferior sorts at from 7s. 6d. to 8s. per ton, Pemberton four-feet is offered at from 7s. 6d. to 8s. per ton, and common coal at from 5s. 6d. to 6s. 6d., per ton, according to quality. Forge and steam coal and engine classes of fuel are still very difficult to move, and slack continues plentiful in the market. Burgoyne at the pit mouth can be bought at from 4s. 6d. to 5s. 3d. per ton, and slack at from 2s. to 3s. per ton, but for some of the best sorts of rough slack, 8s. 6d. to 4s. per ton is asked.

The shipping trade continues extremely dull. The demand for export is very small, and in the coasting trade there has been little or nothing doing. Holders who push for orders have to take extremely low prices, best round coal delivered at the High Level, Liverpool, being offered at 11s. to 11s. 6d., and common coal at 6s. 6d. per ton.

The iron trade shows no improvement; but Lancashire makers of pig iron still hold for 51s. per ton for No. 3 foundry, and 50s. for No. 4 forge, less 2½ per cent., delivered into the Manchester district. Derbyshire iron is again quoted at nearly the same figures as the local brands, but Lincolnshire and Middlesbrough irons are pushed at fully 2s. per ton below what the local producers will accept. Finished iron is without material change as regards price; but, with the exception of a moderately good demand for plates, there are very few orders or inquiries in the market.

Works all through the district continue very short of orders, and many of them are only running half time.

The men, seeing the determined attitude of the masters, are exhibiting a disposition to accept the further reduction of 2½ per cent. this month, and at one of the largest works it has been resolved not to strike against the reduction in wages.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The shipments of Durham coals still fall away. The gas coal trade is not so brisk as it has been, and unless the shipments to the Continent increase considerably, of which there is little or no prospect at present, for there are reports of bad weather from the Baltic, best collieries will undoubtedly be put on shorter time. Second-class pits are in that position already. The price of best gas coals is 7s. 6d.; medium, 7s.; and inferior sorts, 6s. 6d. per ton. Second-class coals of all descriptions, on account of the close approximation of the price of best, are very difficult to get rid of. Inferior steam and manufacturing coals are obtainable at very low prices. The war excitement of the last few days has occasioned the steam coal trade to be a little brisker.

The coasting freight market is dull, and, though rates are not lower, there is a general absence of demand. There has been a firmer tone of business for the Mediterranean and the Black Sea; outward freights thence have advance fully £1 per keel. Trade comes in slowly, however, from the Baltic, and the engagements which have been made have been done at low rates. A good few new orders for coals for Constantinople and the Black Sea are in the market.

There is no material change in the chemical market. There is a steady demand, but nothing in comparison to what there usually is at this time of the year. The iron market is dull. Common bars are selling at £6 5s., and merchants ditto at £9 per ton. Pig iron, local make, No. 1, 45s., No. 3, 41s., net cash. Pig lead is sold at £20 5s.; dry white lead, £24; red lead, £19; Copper, best selected, £76 to £77 per ton. A good few fire-bricks were shipped from the Tyne Dock last week. They were for London. Bricks have likewise been shipped for the Continent, but in very limited quantities.

A great deal of anxiety prevails amongst the trading classes of the North, through the uncertainty which surrounds the Eastern Question. Whether it be peace or war, it looks very like as if the trade of the first half of 1878 is ruined; for the business of the last week of March, in almost every branch of trade, could not well have been worse. The only industry showing anything like satisfactory results is iron shipbuilding; it is pretty busy; so likewise are the ordnance works at Elswick, and some branches of marine engine building, where the vessels which have to be fitted up with engines might be employed as transports.

## TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Dr. Wallace's report on the quality of the Glasgow gas supplied during the week ending the 23rd of March, shows that in no instance was the minimum illuminating power below 25·15 candles, while in one instance it reached 27·07 candles. The maximum ranged from 26·34 candles to 28·65 candles (western district). The quality was very uniform throughout the week in the southern or Tradeston district, as evidence—minimum, 27·07 candles; maximum, 27·44 candles; average, 27·21 candles.

The Police Commissioners of Wishaw have adopted a new scheme for the extension of the water-works. It provides for 47 million gallons, at an estimated cost of £7279, and the Water Committee have been authorized to negotiate as to the purchase of the necessary land.

The Police Commissioners of Lockerbie have adopted plans and specifications for the new reservoir in connection with the extension of the water supply for the burgh. The reservoir which is to be constructed will be capable of containing 20,000 gallons. It is to be completed by the 1st of June next.

It has been resolved by the Police Commissioners of Eyemouth to apply to the Public Loan Commissioners for the sum of £2500, to enable them to bring a supply of water to the town.

Since receiving the report by Mr. Cunningham, C.E., Edinburgh, on a proposed new water supply scheme for Rothesay, the Committee of the Town Council, to whom the matter was remitted, have got scent of another, and, in their opinion, a much better, source of supply than either Loch Aseog or the Dhu Loch. The source is the Ettrick Burn, and the drainage area extends to about 2000 acres, and contains a good naturally formed space for a large reservoir in the centre. The supply which could there be stored would at the ordinary rate give water to a population of from 70,000 to 100,000 people.

The fortnightly return of the quantity of water in the Edinburgh water supply reservoirs shows that on the 26th ult. it amounted to 636,430,349 gallons, or a decrease of 30,477,000 compared with the previous fortnight. The rainfall at Glenconor from the 1st of January to the 26th of March was 6·75 inches, compared with 14·60 inches in the same period of last year, and 11·35 inches in 1876.

With the view of providing a satisfactory water supply for the town of Inverkeithing, the Municipal Authorities of the burgh have agreed to appoint an Engineer to survey a route, and prepare a scheme by which the desired supply may be obtained from the Devon scheme, by which the town of Dunfermline is henceforth to be supplied. The Town Council of Dunfermline have given a sort of preliminary sanction to the proposal.

The Local Authority of Tayport are now showing some inclination to put their "house in order," so far as the domestic water supply is concerned, which has hitherto been very unsatisfactory, judging by the amount of epidemic disease that has been reported from time to time by the medical officer. It has now been resolved to have an analysis made of the water of all the public, and of a certain proportion of the private wells.

There has been a very dull pig iron market during the past week, only a limited amount of business being done, and with little variation in the quotations. The market closed at 51s. 3d. cash and 51s. 4d. one month for sellers, and buyers 1d. less. On the week there was a gain of 1d. per ton.

The coal market continues to be exceedingly languid, and with no prospect of improvement. Wages in a number of instances are being reduced to a lower level than they were at in 1871.

**KEYNSHAM GAS COMPANY.**—The annual meeting was held on the 25th ult., when a dividend of 6 per cent. was declared.

**STEYNING GAS COMPANY.**—The half-yearly meeting was held on the 21st ult., when a dividend on the paid-up capital, of 12s. per share, free of income-tax, and a bonus of 6s. per share, were declared.

**REDUCTIONS IN THE PRICE OF GAS.**—The Directors of the Plymouth Gas Company have given notice that from the 25th of March the price of gas would be reduced to 2s. 3d. per 1000 cubic feet. At Leamington the price will be reduced from 3s. 9d. to 3s. 6d. at Midsummer next.

**PLYMOUTH GAS COMPANY.**—Mr. George Henderson, who projected this Company in 1844, has retired from the Secretaryship, and has been elected a Director, in the place of the late Peter Adams, Esq. Mr. John Thomas, the Accountant, who has been with the Company over 20 years, has been appointed Secretary.

**COLLINGWOOD, FITZROY, AND DISTRICT (AUSTRALIA) GAS COMPANY.**—In the report of the meeting of this Company, given in last week's JOURNAL, page 477, it was stated that Mr. Wier had been appointed Superintendent of the Fitzroy station of the Amalgamated Company. We have since learned that Mr. Wier was formerly Manager of the Collingwood and Fitzroy Gas Company, but is now Chief Superintendent of the Metropolitan Gas Company, under which name the Melbourne, Collingwood and Fitzroy, and South Melbourne Gas Companies have been amalgamated.

**LEAMINGTON PRIORS GAS COMPANY.**—The half-yearly meeting was held at the works on Monday, the 25th ult.—Mr. R. Jones, Chairman of the Company, presiding. The customary dividend of 10 per cent., with a bonus of 5s. per share, was declared upon the original shares; and a dividend of 7 per cent. upon the new capital. A further sum of £1000 was added to the reserve-fund, which now amounts to £2531 5s. 2d. It was decided that, after Midsummer, a further reduction of 3d. per 1000 cubic feet in the price of gas shall be made to private consumers. The price will then be 3s. 6d. per 1000 feet.

**TESTIMONIAL TO MR. R. BRIDGE.**—On Saturday, the 23rd of March, the foremen and a number of the workmen connected with the locomotive works of the Great Northern Railway Company, at Doncaster, assembled in the Reading Room of the Library, to present Mr. Robert Bridge with a testimonial on the occasion of his leaving the employ of the Railway Company, to assume the management of the Doncaster Corporation Gas-Works. The testimonial consisted of a very beautiful timepiece in black marble and side ornaments to match, the whole forming a complete suite for the mantelpiece. The meeting was made the occasion for the expression of mutual congratulations and feelings of sincere friendship.

**IPSWICH GAS SUPPLY.**—The Paving and Lighting Committee of the Corporation of Ipswich have adopted a report of the Sub-Committee appointed on the subject of the gas testing-house, and have resolved that a new testing-house should be provided, and that it should be within the limits prescribed by the statute; that the testing apparatus, when so placed, should be in the custody of the Gas Company, as provided by statute; and that the testing by the Gas Inspector should take place at any time the Inspector desires, he having given six hours previous notice, in accordance with the statute. They have also resolved that it is desirable to purchase and maintain, as the property of the Corporation, a testing apparatus for the private use of the Corporation at the Town Hall.

**HEATING A CITY BY STEAM.**—The experiment of heating Lockport by steam has proved, it is claimed, highly successful. Three miles of pipe properly covered with non-conducting material laid underground through some of the principal streets radiate from a central boiler-house, and fifty different dwellings and other edifices, including one large public school building, have been thoroughly warmed all the winter. Dwellings more than a mile distant from the steam-generator are heated as readily as those next door. Steam-meters are provided, so that each consumer pays for what he consumes. It is claimed that the system can be developed so as to furnish steam at 50 lbs. pressure, transmitted through 20 miles of pipe.—*New York Evening Telegram.*

**LIMERICK GAS COMPANY.**—The half-yearly general meeting of proprietors was held at the offices of the Company, in London, on the 26th ult., Mr. Hudson presiding. The report submitted showed that the rental had considerably increased during the last year, but the amount realized by residuals was less than usual, owing to the mildness of the winter. Additional storage room had been obtained by telescoping the 70-feet gasholder. This work had been completed in the summer, and the Engineer reported favourably of the same. The total receipts, including the balance of undivided profits, amounted to £2383. From this the Directors recommend that a dividend at the rate of 3¼ per cent. on the Company's stock (£36,000) be declared, which would leave a balance of £1033 to be carried forward. The report was adopted.

**TYNEMOUTH GAS COMPANY.**—The annual general meeting of the Shareholders in this Company was held in North Shields last Tuesday. Mr. George Williamson occupied the chair. The report of the Directors was highly satisfactory. It showed that whilst nearly all other securities in the North had been subjected to much depreciation through bad times, gas shares more than held their own. Dividends of 10 per cent. on the original, 7 per cent. on the £10 shares, and 2s. 3d. per share on the shares upon which £2 each had been paid, were declared. The extensive works of the Company were in a thoroughly good and efficient condition. The Directors being able to transfer a respectable balance to next year's account, and having made a good contract for coals, the Shareholders, unasked by the public, made a reduction of 3d. per 1000 feet in the price of gas. The retiring Directors and Auditors were re-elected, and the meeting, to show its sense of the valuable services of Mr. W. H. Atkinson, the able Secretary, over a period of 35 years—that is, since the formation of the Company, by the advice of the Directors, spontaneously advanced that gentleman's salary £100 a year.



**BIRMINGHAM CORPORATION GAS SUPPLY.**—Referring to the report of the Gas Committee of the Corporation, which we published on the 12th ult., the *Birmingham Daily Gazette* remarks: "The statement of accounts, showing a net profit of £36,684, is, on the first blush, highly satisfactory; but when the means by which such a result has been attained are duly considered, the feeling of satisfaction is somewhat modified. The profitability of a gas undertaking such as that belonging to the Corporation of Birmingham, is a mere matter of will on the part of those having the conduct of the affair; and although nothing succeeds like success, and the Gas Committee are not too modest to blow their own trumpets on the slightest provocation, it must be evident to the merest tyro that monopolists have only to will that the price to be paid for the article supplied shall be sufficiently high, and the result is just the amount of profit given by subtracting the expenditure from the receipts. On analyzing the statement laid before the Town Council, we find that the prices charged vary from 4s. 3d. to 2s. 9d., the largest amount received being at the rate of 3s. 3d., per 1000 cubic feet. It is quite understood in gas-making that, other things being equal, the larger the consumption the lower should be the charge to the consumer; and the range of prices, taken, as previously stated, from 4s. 3d. to 2s. 9d., gives a mean of 3s. 6d.; so that the prices paid in Birmingham and surrounding district supplied from the Corporation Gas-Works, as compared with some other towns, are as follows:—

Town.	Population.	Rate per 1000.	Less per Cent. than Birmingham.
Birmingham and District supplied.	1,000,000	3s. 6d.	—
Bristol . . . . .	182,000	3 0	15
Leicester . . . . .	95,000	2 10	19
Nottingham . . . . .	86,000	2 9	21
Leeds . . . . .	259,000	2 8	24
Sheffield . . . . .	239,000	2 7	26
Derby . . . . .	49,000	2 4	33
Wolverhampton . . . . .	68,000	2 4	33
Plymouth . . . . .	68,000	2 4	33

And what is further to be remarked is, that the poorer the consumer, and the more important to him, therefore, the price of gas, the higher he is charged, the large consumer paying but 2s. 9d. per 1000, while the small consumer is mulcted in some instances at the rate of 4s. 3d., and in no case at less than 3s. 3d., for the gas he consumes."

**RIVERS POLLUTION ACT.**—On the 22nd ult., Mr. J. T. Harrison, C.E., an Inspector from the Local Government Board, held an inquiry at the offices of the Withington Local Board relative to an application of the Board for an order declaring that the third section of the Rivers Pollution Act, 1876, shall not be in operation until the expiration of a period to be named in such order, so far as regards the discharge of sewage matter into the River Mersey. Mr. W. Brockbank, Mr. Robert Knowles, and Mr. S. Yates, owners of land at Didsbury, where the outfalls of the sewers are situated, appeared in opposition to the Local Board on some points. Mr. Fuller, Chairman of the Local Board, explained that the Withington sewers at present fall into the River Mersey, and that the Board propose to carry out a scheme for the purification of the sewage. That, however, was a work that required time, and they desired the Local Government Board to suspend the operation of the third section of the above-named Act, so as to protect them from the consequences of any illegality, until they had had time to carry out the proposed work. The Inspector said the Board must first show him what they proposed to do. He must then be satisfied that they were in earnest, and on their showing that they were prepared to lay plans before the Local Government Board within a certain time, and it appeared reasonable to allow that time, he would recommend that the time be allowed. At the expiration of that period they would have to go before

the Local Government Board with plans and estimates, and make application for power to carry out the works, upon which the Board would grant them a further extension of time. Mr. Brockbank said the thing that he and others objected to was, that in the meantime the Board wished to turn a great many more sewers into the existing channels. He did not object to the Board having time to carry out a scheme for the purification of the sewage. The Inspector said he had nothing to do with the Board's intentions in other matters than those which formed the subject of this inquiry; but he did not think that any order suspending the operation of the Act would interfere with Mr. Brockbank's seeking to restrain the Board from doing what he had alleged was contemplated by them. Mr. Brockbank said they purposed filing a Bill in Chancery, when the Board attempted to turn additional sewers into the existing channels. If the Board, however, would satisfy him that they were in earnest, and going to promote a sensible scheme, he would work with them heart and soul. Mr. Newton (Messrs. Cawley and Newton, engineers) said that, in accordance with instructions from the Local Board, he had considered various means of dealing with the sewage, and his report was now under consideration. Within three or four months he could have plans to submit to the Local Government Board, and then, if the course were clear, these plans could be carried out in three years. Mr. Fuller intimated that the Board had been in communication with the Manchester Corporation on the subject, and, if the latter body would undertake to deal with the sewage at a cost not much greater than a separate scheme was likely to entail, the Board would prefer to hand over the responsibility to the Corporation. The Inspector, in the course of some remarks as to the drainage of adjoining districts, advocated the desirability of the Withington, Rusholme, and Levensholme Boards uniting in the accomplishment of one general scheme. Having stated that he should not hesitate to recommend the Local Government Board to grant a suspension for six months in the first instance, the proceedings terminated.

## Register of New Patents.

### APPLICATIONS FOR LETTERS PATENT.

- 1154.—RAWLINGS, H., Westminster, "Improvements in filters for water and other liquids." March 23, 1878.  
1174.—SLEE, J., Earlestown, Lancs, "Improvements in direct-acting steam-pumps." March 25, 1878.  
1198.—PATTINSON, J., Sheffield, "Improvements in adjustable spanners." March 26, 1878.  
1213.—OWEN, S., Coventry, Warwick, "Improvements in modes and apparatus for opening and closing cocks and valves, especially applicable to the simultaneous lighting and extinguishing of street and other lamps." March 27, 1878.  
1217.—WILSON, A. F., Southwark, London, and DOUGLAS, T., Aldershot, Hants, "Improvements in the construction of furnaces applicable to the heating of gas-retorts or for other purposes." March 28, 1878.  
1219.—KIRKHAM, T. N., Westminster, and CHANDLER, S., Newington Causeway, London, "Improvements in apparatus used in the manufacture of gas." (Complete specification.) March 28, 1878.

### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 3618.—LONGSHAW, J., Warrington, Lancs, "Improvements in the method of and apparatus for lighting street and other gas lamps." Sept. 27, 1877.  
4346.—STEPHAN, J. A., Worcester, "Improvements in the manufacture of carburetted hydrogen and oxyhydrogen gases." Nov. 20, 1877.

## Share List of Metropolitan Gas and Water Companies.

(Corrected by Mr. F. N. GOLDING, Sun Court, Cornhill, from the latest Stock Exchange Quotations.)

Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent. p. Ann.	Latest Quotations.
10000	20	£ GAS COMPANIES.	£ s. d.	£ s. d.	£	56000	50	£ GAS COMPANIES.	£ s. d.	£ s. d.	£	15000	10	£ GAS COMPANIES.	£ s. d.	£ s. d.	£
5000	20	Anglo-Romano . . . . .	20 0 0	9 0 0	20-25	9000	5	Impr. Continental	45 15 0	5 1/2 p.sh.	88-92	10000	10	Wandsworth & Putney	10 0 0	10 0 0	19-20
1000	20	Bahia (Limited) . . . . .	20 0 0	9 3 0	10-11	383000	Sk.	Limerick Gas . . . . .	5 0 0	2 10 0	3-3 1/2	1500	10	Do. . . . .	10 0 0	7 10 0	11-12
1500	20	Do., 2d. redeem. . . . .	20 0 0	10 0 0	..	150000	Sk.	London . . . . .	100 0 0	10 0 0	190-195	2957	10	Do. . . . .	10 0 0	7 0 0	..
40000	5	Do., 2nd pref. . . . .	20 0 0	7 10 0	..	14450	Sk.	Do., 1st pref. . . . .	100 0 0	6 0 0	130-140	993	10	Do. . . . .	3 0 0	7 0 0	..
10000	5	Bombay (Limited) . . . . .	5 0 0	7 10 0	62-7 1/2	4350	Sk.	Do., 2nd pref. . . . .	100 0 0	6 0 0	120-130	26000	5	West Ham . . . . .	5 0 0	10 0 0	8-9
14070	20	Do., fourth issue. . . . .	4 0 0	7 0 0	5-5 1/2	7622	25	Do., 3rd pref. . . . .	100 0 0	6 0 0	120-130						
7500	20	British (Limited) . . . . .	20 0 0	10 0 0	38-40	263057	All	Do., A shares . . . . .	25 0 0	6 0 0	32-34						
35000	02	Cagliari (Limited) . . . . .	20 0 0	6 0 0	16-18	15000	5	Do., Debent. stk. . . . .	100 0 0	5 1/2 & 6 1/2	..						
70000	100	Commercial . . . . .	100 0 0	10 0 0	193-197	6000	5	Malta and Mediteranean (Limited) . . . . .	5 0 0	2 0 0	2-2 1/2						
20000	20	Do., 7 per cent. . . . .	..	..	139-141	20000	5	Do., preference . . . . .	5 0 0	7 10 0	5-5 1/2						
20000	20	Continental Union. . . . .	20 0 0	6 0 0	18 1/2-19 1/2	25000	20	Mauritius (Limited) . . . . .	2 5 0	2 10 0	1-1						
10000	20	Do., new . . . . .	12 10 0	6 0 0	14 ds. par	8000	10	Monte Video (Lim.) . . . . .	20 0 0	8 0 0	17 1/2-18 1/2						
75000	Sk.	Do., preference . . . . .	20 0 0	7 0 0	24-26			Nietheroy, Brazil (Limited) . . . . .	10 0 0	5 0 0	..						
125000	Sk.	Crystal Palace District . . . . .	100 0 0	10 0 0	195-201	30000	5	Oriental (Calcutta) . . . . .	5 0 0	9 10 0	7-7 1/2	12000	100	Chelsea . . . . .	100 0 0	6 0 0	148-152
50000	Sk.	Do., 7 per cent. . . . .	100 0 0	7 0 0	138-141	30000	5	Do., new shares . . . . .	3 0 0	9 10 0	11-1 1/2	1800000	100	East London . . . . .	100 0 0	6 0 0	153-158
23405	10	Do., preference . . . . .	10 0 0	6 0 0	125-131	10000	5	Do., Ottoman (Limited) . . . . .	5 0 0	3 0 0	2-3	8000	50	Grand Junction . . . . .	50 0 0	5 0 0	79-81
12000	10	European (Limited) . . . . .	10 0 0	10 0 0	16 1/2-17 1/2	10000	10	Para (Limited) . . . . .	10 0 0	2 0 0	4 1/2-5 1/2	5840	25	Do., 1/4 shares . . . . .	25 0 0	5 0 0	39 1/2-40 1/2
35405	10	Do., new shares . . . . .	7 10 0	10 0 0	5-6 pm	27000	20	Phoenix . . . . .	20 0 0	10 0 0	38-40	2160	25	Do., new ditto; max. div. 7 1/2 p.c. . . . .	25 0 0	5 0 0	33-34
40948407	Sk.	Do., 5 per cent. pref. . . . .	5 0 0	10 0 0	186-191	360000	100	Do., new max. 7 1/2 p.c. . . . .	60 0 0	7 10 0	104-109	547960	100	Kent . . . . .	100 0 0	8 0 0	202-207
100000	Sk.	Do. B . . . . .	100 0 0	4 0 0	78-82	144000	Sk.	Do., capitalized . . . . .	100 0 0	5 0 0	103-106	970	100	Do., max. 7 1/2 p.c. . . . .	100 0 0	6 5 0	150-154
50000	10	Do. 5 per cent. pref. conv., 4th issue. . . . .	10 0 0	5 0 0	..	37500	20	Do., new, 1876 . . . . .	20 0 0	10 0 0	14-15 pm	1161	100	Lambeth . . . . .	100 0 0	6 5 0	146-152
200000	Sk.	Do. do., 5th do. . . . .	4 0 0	5 0 0	5-6 pm	7359	5	Rio de Janeiro (L.) . . . . .	5 0 0	7 10 0	5 1/2-5 3/4	442	100	New River . . . . .	100 0 0	7 0 0	320-350
300000	Sk.	Do. C 10 p.c. pref. . . . .	100 0 0	10 0 0	204-208	2000	5	Singapore (Limited) . . . . .	5 0 0	7 10 0	5 1/2-6 1/4	4475	100	Do., deb. sk. 4 p.c. . . . .	100 0 0	4 0 0	103-105
165000	Sk.	Do. D do. do. . . . .	100 0 0	10 0 0	204-208	1500	32 1/2	Do., preference . . . . .	5 0 0	7 10 0	5 1/2-6 1/4	3036	100	Southwark & Vauxh. . . . .	100 0 0	2 0 0	98-102
30000	Sk.	Do. E do. do. . . . .	100 0 0	10 0 0	204-208	4000	50	Shanghai . . . . .	50 0 0	11 0 0	108-111	1296	100	Do., pref. stock . . . . .	100 0 0	5 0 0	116-118
60000	Sk.	Do. F 5 do. do. . . . .	100 0 0	5 0 0	101-101	4000	12 1/2	Do., South Metropolitan . . . . .	12 10 0	10 0 0	25-27	..	100	Do., D shares . . . . .	100 0 0	4 0 0	98-100
1300000	Sk.	Do. G 7 1/2 do. do. . . . .	100 0 0	7 10 0	140-151	20000	12 1/2	Do., new shares . . . . .	10 10 0	10 0 0	13 1/2-14 1/2	1690	100	Do., new ordinary . . . . .	..	4 10 0	..
6200	5	Do. H . . . . .	100 0 0	7 0 0	129-141	15000	10	Do., new ord. No. 1 . . . . .	40 0 0	0 0 0	4 10 0	12172	61	Do., new ord. No. 1 . . . . .	40 0 0	0 0 0	4 10 0
5900	10	Georgetown, Guiana . . . . .	5 0 0	5 0 0	..	10000	10	Do., new . . . . .	8 0 0	10 0 0	7 8			West Middlesex . . . . .	61 0 0	6 1/2 p.sh.	139-142
		Hong Kong (Lim.) . . . . .	10 0 0	10 0 0	18-20												

## TO GAS ENGINEERS.

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Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

## TAY WORKS, BONNINGTON, EDINBURGH.



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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 9, 1878.

Circular to Gas Companies.

SIR CHARLES ADDERLEY has had a fall up stairs, and, vacating the office of the President of the Board of Trade, is to be succeeded by Lord Sandon, an excellent man of business, who has made his mark as the real head of the Education Department. What, however, he may know about trade, even as it is understood in Whitehall Gardens, we do not comprehend. In the shuffling and cutting of the pack, although a trump must be found, it may be a very small one. We have a very high opinion of Lord Sandon, and regret that he has been removed from the position he recently held. While considering matters of trade, we hold to the opinion that a man practised in commerce should be the head of a Government department which, nominally and really, is concerned with the control of many trading adventures. We have repeatedly pointed out that when the unskilled and inexperienced are translated into offices of this kind, they necessarily follow the traditions of the department. There is no such thing as a policy, in the true sense of the word, at all. The official groove is run into. The President becomes the instrument of permanent officials, and all goes smoothly. At the present moment, when we have a tolerably distinct announcement that the Government will at no distant date deal with the Metropolitan Gas Question, the President of the Board of Trade becomes a man of prominent interest to us. It may be that Mr. Cross, as Home Secretary, will assume the responsibility of dealing with the matter. The Board of Trade are, however, certain to exercise some control. Mr. Cross's statement, at the close of the debate on Saturday morning, clearly announced the intention of the present Government to deal with both the Metropolitan Gas and Water Questions. The pretensions of the Metropolitan Board of Works are thus completely frustrated, and to-day will probably see the disappearance of all the hopes of this "meddling and muddling" body. It is not merely the simple Gas and Water Problem with which the Government apparently propose to deal. They still have in their minds the question of the administration of the Fire Brigade. As to this matter, they are, to a

certain extent, bound by the report from the Select Committee of the House of Commons, who recommended the transference of the control of the Fire Brigade to the Metropolitan Police. To what body, however, do the Government intend to delegate the management of the gas and water undertakings, failing the Metropolitan Board, whose case seems to be hopeless, and awaiting the constitution of a Municipality for the whole of London, which seems to be indefinitely postponed? Nothing would be more easy than, if the Government so willed it, to confiscate these wealthy undertakings; but, to whom could the subsequent management be entrusted? A specially constituted Commission, as has been suggested, might answer the purpose; but what, then, would be done with the profits? If the undertakings were made simply self-supporting, no difficulty would arise, but we are not certain that public opinion would be satisfied. If the undertakings were managed under the Scottish system, and made simply self-supporting, all would be well; but, unhappily, in England, Local Authorities are so indoctrinated with the notion that gas and water—gas-works especially—ought to be made to contribute to the cost of public improvements, that we fear much dissatisfaction would be expressed if it were proposed to adopt the Scottish system in the Metropolis. The question, however, is not yet quite ripe for a full discussion. All we have to note at the present moment is, that the Government evince a desire to deal with the Metropolitan Gas and Water Question, and until their intentions are further revealed, which will probably be to-night, we will leave the matter as it now stands.

It is hardly necessary to say that the half-yearly meetings of the Metropolitan Gas Companies, which we report this week, have passed off with something like *éclat*. When referring to the meeting of the Phoenix Gas Company, we cannot refrain from an expression of regret at the absence of the Chairman of that Company through ill-health. Mr. Horner has been so long at the head of the Company, and has been such a determined advocate of the legitimate rights of Gas Proprietors, that even his provisional loss to the Direction is a serious misfortune. Let us hope that he will soon return to his duties with renewed vigour. As regards the position of the Company, there is nothing but what is favourable to report. Their operations for the past half year have, notwithstanding a reduction in the price of gas, resulted in a profit of £47,184, and out of this they are, of course, able to declare maximum dividends, and then to carry forward £5084. It is highly satisfactory to see that the Directors are paying constant attention to the development of their undertaking. The completion of the new holder at Kennington, which will be the largest in the Metropolis, is looked forward to with much interest. The tank we regard as an engineering triumph, having entertained doubts as to the nature of the subsoil on which the foundations rest. At Greenwich, in different ground, no less success has been obtained, and the Company will presently have sufficient storage to last them for years. We note that the Deputy-Chairman remarks on the possibility of the Company soon being obliged to make a fresh application to Parliament for further powers. No doubt, if matters remain as they are, such application will be necessary in the course of a year or two, and we may here once more point out, in view of such an event, the desirability of amalgamation. The present moment strikes us as propitious for combination. We have not just now any burning question, but it seems certain that we shall presently be assailed by powerful Government influences, which may best be combated by firm union. When remarking, last week, on the affairs of the Surrey Consumers Gas Company, we ventured to point out once more the possibility of a southern amalgamation. The more we study the question, and endeavour, to the best of our ability, to forecast the future, the more certain we become that the interests of the Gas Companies south of the Thames would be best consulted by effecting their union.

The meeting of the London Gaslight Company was, of course, a pleasant gathering. As we have already announced, the Company pay full dividends, and carry forward a respectable balance. It is not unnatural that the electric light should crop up at all these meetings. There is a sort of mitigated scare amongst Gas Shareholders, which makes them nervously anxious about this mode of illumination. We have done our best to allay their anxiety by pointing out that, from most reliable scientific information, we have come to the opinion that, for generations to come, electricity will never compete with gas as a domestic illuminant. We have pointed out candidly what it may do, and our readers may be prepared to witness, within the next ten or twenty years, the illumination of large public buildings and wide open spaces by electricity; but there, we believe, the competition will end, until discoveries are made, of which at, present,



science gives us no foreshadowings. Hence, Gas Proprietors may rest content with their property, unless seriously concerned for the interests of their great-grandchildren. Before these are begotten, many things may turn up, of which it is possible that electricity will be the least important.

The announcement that the Directors of the Commercial Gas Company proposed to declare a dividend of ten and a half per cent., free of income-tax, came upon the public as a surprise; and a delay having taken place in the issue of the report, some comment was excited. We do not suppose that those in the secret had many opportunities of making good bargains on the Stock Exchange; but it is best to avoid all cause for scandal, and it would be as well in the future to publish the report and accounts as soon as the Directors have decided on the dividend. No remarks are necessary on the state of the Company's affairs. The undertaking is eminently prosperous, and must become increasingly so. The new works at Bromley, which, it seems, are now approaching completion, will add largely to the manufacturing resources of the Company, and will leave it in their power to meet all requirements for many years to come. The accounts, which we publish in another column, show that, after paying the £400 fine, which, as the law requires, must be taken from the money applicable to dividends, and providing for the payment of income-tax, there remains a balance which admits of the payment of dividends of a half per cent. in excess of normal rates, and then leaves sufficient to pay one per cent. on the capital for an insurance-fund, and a substantial balance to be carried to the reserve. Commentary on success like this is unnecessary.

We publish to-day the report and accounts of the Alliance and Dublin Gas Company, which bear out the statements we made last week. The success of this Company is now well established, but, as the Chairman points out in his speech, some financial skill will be necessary in manipulating their monetary affairs. It will, of course, be well to avoid the issue of new capital as long as possible, and, at the same time, to get rid of debts. With this view the Directors retain in hand the considerable balance left after paying the dividends. If things go well, the permanency of full dividends is now assured in Dublin; but still, an eye must be had to contingencies. We note, with pleasure, the intention of the Directors to devote some annuities, which have recently fallen in, to the foundation of a superannuation fund. This, supplemented by the contributions of the officers, will presently, we hope, be sufficient to afford an allowance to every faithful officer compelled to retire, from age or infirmity, without the imposition of any additional tax on the Shareholders.

We have been favoured with a copy of the "Wigan Corporation Gas-Works Special Report on the Accounts, from "July 1, 1874, to Dec. 31, 1877, made by the Auditor," and after a cursory examination—for the accounts are rather long and intricate—we feel bound to say that the report affords a complete answer to the allegations of Mr. Templeton. The Auditor shows clearly how, in one instance at least, the blunder was fallen into. It was taking, as a trading account, the cash account of the Borough Treasurer, which is simply a banking account. The original fault of the Gas Committee, however, still remains; they did not file the accounts as they are required to do by Act of Parliament. Good as the best intentions of honest men may be, they should never, for their own comfort, shirk obedience to the law.

The Town Council of Reading, generally very well satisfied with the Gas Company, are just now exercised about the appointment of officers to test the illuminating power and purity of the gas. The steps they propose to take are highly absurd. They have, at present, an Inspector who occasionally tests the illuminating power, and now they propose to appoint the Borough Analyst to make an examination of the purity four times a year. If a thing be worth doing at all, it is worth doing well; and if effective examinations are to be made, they should be made frequently. But this would cost money, and to any increase in their expenditure the Reading Town Council are exceedingly averse. It is not, however, necessary that they should spend a farthing; they may safely trust the Gas Company to supply them with as good gas as their special Act requires.

Water gas, it is possible, may again be brought under the notice of the British public in the ensuing summer, for considerable developments in the manufacture have taken place in America, of which we shall probably soon hear something. In the meantime, we need not take serious notice of experiments being made at Worcester, of which the local press seem to think a good deal. It is reported that the Corporation of Birmingham are about to examine the merits of the scheme, but to this statement we do not give implicit credence. It appears, however,

that the reported success of water gas has, for the time, diverted the attention of the Worcester Corporation from their attempt to purchase the undertaking of the Worcester Gas Company. The Company are apparently not desirous to sell, and the Corporation, under existing circumstances, can make no progress with their negotiations.

The confidence of the Swansea public remains undiminished in the Gas Company, notwithstanding the virulent and persistent endeavours of the Proprietor and Editor of a certain local journal to damage the undertaking. A recent sale of shares by public auction brought full prices, and perhaps the writer referred to is not aware that, by his reiterated advice to the Corporation, he is, in reality, advancing the interests of the Shareholders, who must, in the event of purchase by the Local Authority, obtain terms which would amply compensate for their venture. The Company, however, will stand alone as long as they are able, and since the great majority of the Swansea public are perfectly content with them and the article they supply, we may take it that the Company will long remain without being seriously assailed.

### Water and Sanitary Notes.

THE adjourned debate on the second reading of the Metropolis Water-Works (Purchase) Bill has been postponed until this evening; but, in face of the statement by the Home Secretary, Mr. Cross, on Friday last, it seems most probable that no second reading will take place. We must wait until to-night, or, perhaps, longer, to learn the exact intentions of the Government; but it appears, from the preliminary statement of the Home Secretary, that the Government design to deal with the whole question at no distant date. The Executive evidently see difficulties in the way of placing the management of the water supply under the control of the Metropolitan Board of Works, and, perhaps, cannot see their way clear, at present, to propose any other body to exercise such control. We can sympathize with them in this emergency; for we do not know how, in the absence of a Municipality, the Water Companies can be dispensed with. Amalgamation among themselves, with the extended powers they would, under such circumstances, be certain to obtain, would really effect all the objects to be attained by amalgamation under some Local Authority; but combination among the Metropolitan Water Companies, without some official control, would be difficult, if not impossible. Great as the advantages which might ensue, personal and other jealousies would, doubtless, stand in the way of a complete union.

The House of Commons broke up on Friday night, or, rather, Saturday morning, when the short hours were beginning to become long, and tired reporters had gone to finish their "copy" and then home to bed. The indefatigable Mr. Fawcett, however, remained in his place, and when the order for the second reading of the Purchase Bill was reached, he proposed that the whole question should be referred to a Select Committee. The honourable gentleman has an idea that the market is being "rigged" to enhance the value of shares in Water Companies. He does not seem to understand that shares of Metropolitan Water Companies have a definite value, quite irrespective of any purchase by a Local Authority. A compulsory purchase would, of course, increase their value; but few speculators, we think, would be disposed to discount the sum that might be anticipated. Up to this moment we have heard nothing of any attempts to heighten the value of water shares; and, indeed, the reasonably entertained doubt as to whether, or not, the Metropolitan Board would be allowed to take over the undertakings, seems entirely to preclude any speculation of the kind.

Rather too late in the day, a gentleman, signing himself "A Civil Engineer," has come forward with a pamphlet,\* which completely demolishes the idea that any advantage to the Metropolitan water consumer or ratepayer can possibly result from the purchase of the water undertakings by the Metropolitan Board of Works. The author employs at length the arguments which we, with our restricted space, could but little more than hint at, and we are bound to say he has most ably used them. We may pass over the extended domination of the Metropolitan Board, which would be involved in the purchase of the Companies, and we come at once to the figures which would undoubtedly represent the cost of the undertakings to the Board. The actual amount of capital expended by the Companies, up to about this date, is £11,614,179. The average amount of interest

\* "The London Water Supply, being an Examination of the Alleged Advantages of the Schemes of the Metropolitan Board of Works, and of the Inevitable Increase of Rates which would be required thereby." By a Civil Engineer. London: E. and F. N. Spon. 1878.



paid on this sum is 6·58 per cent. Now, the author calculates correctly that, taking the value of Three per Cent. Consols at £95, the value of £100, at 6·58 per cent., will be £208·5. To pay the Water-Works Proprietors in cash, at the bare value of their stock, therefore, £208 10s. will have to be given for every £100 of existing stock, which gives the sum of £24,225,564, without any compensation for compulsory purchase. The bonus to be added for compensation, which it is proposed to settle by arbitration, will probably bring the amount up to £30,281,955, about the sum at which, our readers will remember, we have in later times estimated the value of the undertakings. The author goes on to show that, if the projected changes and additions be carried out, a much larger sum must be expended; and he estimates that before the Metropolitan Board are fully settled in possession of the present undertakings and their new supply no less a sum than from £50,000,000 to £55,000,000 sterling is likely to be expended. How is it possible that works acquired at this enormous cost can be made self-remunerative? It is perfectly impossible; and it is quite certain that large additional taxation will be required beyond what is necessary to pay for the simple water supply. What that may amount to it is impossible to say, but the Metropolitan ratepayer who takes notes of matters as they pass, will long hesitate before he sanctions the acquisition of the water undertakings by the Metropolitan Board.

When introducing the Budget, the Chancellor of the Exchequer made some remarks pregnant with instruction to those who will take them to heart. He dwelt upon the increased indebtedness of Local Authorities, which is now imposing serious inconveniences upon a Chancellor of the Exchequer. We regard the difficulty of dealing with the Unfunded Debt as a matter of very small importance. The £20,000,000 may be funded to-morrow; no one will complain; but it is that unfortunate individual, the ratepayer, we are thinking of. He has to provide for the interest on the loans, and the sinking-fund for the repayment thereof; and wherever we go we are met with the complaint "that we are "eaten up with rates," and every small tradesman tells you that but for the rates he would do very well. Some stop will presently have to be put upon loans for unproductive works. The burden is becoming too great for ordinary ratepayers to bear, and an entire revision of our system of providing loans for unproductive works must presently be entered upon. It has been repeatedly said in these columns that at least one-half of the Local Authorities of this kingdom—and we cannot exclude the Corporation of the City of London—are practically insolvent; and supposing the present depressed condition of trade to continue, a number of our Local Authorities must imitate the city of Florence, and go into liquidation.

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### TESTINGS FOR ILLUMINATING POWER AND THEIR DIFFICULTIES.

SIR,—The North British Association of Gas Managers, in their circular of the 20th inst., invite members to contribute papers for the meeting in July next at St. Andrew's, and suggest a variety of subjects for such papers. One is "On the Relationship between the Various Tests of the Illuminating Power of Gas." Taking the test by the photometer as the ultimate determination of illuminating power, every Gas Manager who habitually employs subsidiary or inferential tests must have found frequent discrepancies between the reality and the inferences so deduced; and, perhaps, there is no matter connected with gas manufacture that stands so much in need of careful investigation, in order to the establishment of more exactitude in their relations, and the explanation of the causes of discrepancy, and how such can be avoided or corrected. While generally it is true that an increase in candle power gives a nearly corresponding increase in the durability of a cubic foot of gas in sustaining a fixed length of flame, and an increased per centage in the volume condensed by bromine, and *vice versa*, it is often found that these proportional relations become perplexingly disturbed from other causes, and, notably, from fluctuations in the temperature of the retort within which carbonization is effected. It has often occurred in my experience that in repeating a test of coal already tried, and immediately after, if the heat should have varied from "dull red" to "moderate," or from that to "sharp," the comparative results are so divergent that it is difficult to identify them with the same mineral; thus pointing to the felt want of some efficient methods whereby temperature, and period of exposure to carbonization in the retort, could be regulated to bring out the best results from any given quality of gas coal.

I may venture to suggest that this subject is well deserving the attention of our younger and advancing Gas Engineers, and any practical solution of the question, arrived at through careful investigation, would be sure to meet with a hearty welcome at the next annual meeting.

In the course of a rather lengthened experience, I have tested all the best known varieties of Scotch cannel coals, and preserved the records thereof; and there is nothing so perplexing as to find such varying results in different trials of the same coal, especially in respect of the bromine and durability tests, when compared with the candle power by

the photometer. I annex a few examples of these tests taken within the last few weeks, some of which in the repetitions exhibit such discrepancies. I may venture to say that the trials were all made with the greatest personal care, and that the manufacturing and testing apparatus are of the best kinds.

The retort is of cast iron, 7 feet long by 12 inches diameter, and is associated with complete condensers, purifiers, station-meter, and everything to match. The temperature of the retort, judged by the eye, was variously noted, as in the annexed table, and, as compared with fire-clay retorts, I find the action of the iron retort at *fair heat* has an energy equal to a clay retort at *bright sharp*.

Name of Cannel.	Heat of Retort.	Produce of Gas per Ton of Coal.	Per Centage Condensation by Bromine.	Duration of One Cubic Ft. Single-hole Jet, 4 Inches long.	Candle Power by Photometer.	Remarks.
		Feet.		Min. Sec.		
A	Fair heat.	12,186	14·00	80 00	31·61	These not consecutive, but same coal; four years interval.
"	Sharp.	14,453	11·00	76 50	33·20	
B	Fair heat.	11,040	12·00	75 40	36·30	Consecutive.
"	Sharp.	11,760	12·50	80 00	34·90	
C	Fair.	10,133	8·50	65 00	20·66	Consecutive.
"	Low.	9,933	7·25	62 30	22·90	
"	Sharp.	10,880	6·25	57 30	18·50	At three weeks interval.
D	Fair.	12,085	8·40	69 00	27·54	
"	Sharp.	12,373	9·25	66 00	22·50	Consecutive in 1873.
E	Fair.	10,560	10·50	75 40	32·20	
"	Sharp.	10,906	11·25	72 00	31·08	Same as last coal, but tested consecutively, March, 1878.
Ea	Sharp.	11,696	9·00	64 00	24·00	
"	Fair.	10,288	11·25	71 30	28·60	Consecutive.
F	Sharp.	10,533	9·50	65 00	23·19	
"	Fair.	10,000	9·00	67 00	25·42	Consecutive, 1878.
G	Sharp.	11,200	4·00	50 00	11·93	
"	Fair.	10,200	4·75	55 00	13·77	Consecutive, 1878.
H	Sharp.	10,923	10·00	68 20	31·14	
"	Fair.	12,016	9·50	66 40	31·42	Consecutive, 1873.
K	Sharp.	13,597	11·25	71 20	31·61	
"	Fair.	13,619	12·20	75 30	32·24	Consecutive, 1878.
L	Sharp.	12,192	8·00	63 20	23·03	
"	Moderate.	11,200	11·10	73 30	28·63	Poor splint coal.
M	Sharp.	10,080	3·25	50 00	10 20	
"	Fair.	8,413	3·50	50 00	9 20	Consecutive.
N	Fair.	9,866	9·75	72 30	28·76	
"	Sharp.	10,066	9·00	68 20	27·56	

Perhaps the suggestion of this topic of inquiry may result in something worth the trouble, if you see fit to give it a place in the JOURNAL, and the figures in the table may afford some examples requiring solution.

The particular coals tested are well-known Scottish cannels, which, for obvious reasons, it is expedient should only be distinguished by letters of the alphabet.

Edinburgh, March 30, 1878.

JOHN REID.

### WANTED, A RULE.

SIR,—Will any of your readers be good enough to state their experience of the decreased yield of gas from ordinary Newcastle coal, resulting from increased illuminating power?

Take an ordinary coal, producing 9500 feet of 14-candle gas; if it is desired to produce 17-candle gas out of this coal, what then is the quantity made per ton of coal, and the yield per ton for 16½, 16, 15½, 15, and 14½ candle gas?

April 1, 1878.

Q.

### WHO SHALL PAY THE WATER-RATES?

SIR,—I see in the account of the proceedings of the Newington Vestry, published in the *South London Press*, on March 30 last, is the following:—

The Medical Officer in his report "suggests that, in the event of the Metropolitan Board of Works acquiring the water supply of London, the supply of water should be made compulsory, and that under no circumstances should the power of cutting off be sanctioned. The supply of water was a monopoly, whoever was the directing power; and, unlike anything else, it was necessary for life, for domestic and for sanitary purposes."

These remarks seem to have arisen from some six houses in Boundary Lane having their water cut off. Now, I think the matter seems thoroughly misunderstood; a glance at the history of the Companies will show this.

Timbs, in his "Curiosities of London," says "that the earliest water supply was derived from the Thames by direct carriage, or from bournes or streams which flowed through the town, but are now covered sewers. The water was laid from these springs in leaden pipes, as early as the reign of Henry III., to conduits in various parts of the town, whence it was conveyed in buckets and carts. In 1581, Morice threw a jet of the Thames over old St. Magnus Church; next year was formed the London Bridge Water-Works. In 1613 was opened the New River, when commenced the modern system of supply now executed by seven Companies."

The Southwark, Lambeth, Kent, and other Water Companies, are really, then, nothing but *water carriers*; they do not manufacture the commodity, nor do they purchase it to sell again, but they merely fetch it from some source and, at great expense, filter it, and then deliver it, by means of pipes, to their customers. But the article may be procured free, either from the River, or from any spring, provided the person requiring it goes to the same expense as these Companies do for him, either by fetching it, or sinking a well and obtaining it. Should the Board of Works acquire the water supply, I think it will be very hard upon those persons who honestly pay for the privilege of having the water brought to them, by, in effect, making them pay for such dishonest landlords who, collecting their rents weekly (the water-rate included in that rent), allow their tenants to be deprived of the water



supply by not paying their rates. I think the proper course is for the Company or Board of Works, as heretofore, upon non-payment, to stop the supply, and for the Vestry then to take proceedings against the defaulting landlord for not giving his tenants the necessary accommodation.

I think it would be very hard upon a baker or a butcher to be compelled to supply bread or meat (both necessary for life) to a person who has already run a six or nine months bill, and tell him his remedy lies in the County Court, where he may obtain his bill at the liberal rate of, say, 5s. per month, he in the meantime increasing his debtor's account.

Some of your readers will say that these Companies have, or that the Board of Works will have, a monopoly. Granted so; but they are, or will be, limited to profits. Their accounts are publicly audited, their commodity tested, and a certain quantity is demanded, and the supply, providing it is paid for, compulsory.

I think the Newton medical officer has in his mind the *Entreprise des Pompes Funèbres* of Paris, who bury the poor gratis, and charge it in the funerals of the rich, and would like to see the Water Companies of London compelled to do likewise.

AQUARIUS.

#### EXETER GAS.

SIR,—Will you allow me to say a word or two in support of Mr. Spice's letter in reference to gas matters at Exeter. I, like the rest of your readers, had been looking forward to some such startling announcement as that Exeter was in darkness, or that all the inhabitants of the city were suffering from asphyxia, or some such fearful visitation, owing to the poisonous exhalations from the gas-works; but, judge of my surprise, on a recent visit to the city, to see the streets and shops well lighted, and with gas of fair quality. I was engaged at the Athenæum to give a lecture on "Artificial Light," and, in the course of my experimental illustrations, I had to use the gas of the hall in various ways, and I certainly could not discover any defect in it, either as regards pressure, supply, or illuminating power. I began to inquire into the merits of the gas question, and I soon found it was simply a matter of feeling on the part of a section of the Corporation, who have set their minds on becoming the proprietors of both the water and the gas supply, and they base their claim to absorb the latter Company on certain professional opinions which have been expressed, in which it has been recklessly asserted that the gas-works at present are all but useless, that gas cannot be properly manufactured in them; in fact, that the only remedy for such a disastrous state of things lies in the Corporation taking the supply of gas into their own hands. Encouraged by such an opinion, the Corporation have suggested terms which, as Mr. Spice very justly says, are perfectly ridiculous. Can any person with a grain of common sense believe that the gas-works of a city consuming nearly 100 millions of gas a year are in such a deplorable state as to be utterly worthless? They may not be as symmetrical in their arrangement as gentlemen with fastidious tastes may desire; they may be deficient in monster purifiers and sump-houses scrubbing towers; the meter and governor rooms may not be resplendent with mosaic pavements and elaborately-painted walls; but the works do supply the city with gas, and a few thousands of pounds judiciously expended would make them, for all practical purposes, as efficient as any of those so highly-lauded works of recent construction. I am very happy to learn that the Company have not accepted the terms offered by the Corporation, and, so far from believing in the efficiency of Corporation management, I am most thoroughly convinced that the absorption of gas-works by the Public Authorities will have a tendency very materially to retard real progress in the science of gas lighting. I have had the opportunity of comparing the results of Corporate manufactured gas and that supplied by private Companies, and I most unhesitatingly assert that the consumer is better served by the latter than the former in a majority of cases.

42, Pentonville Road, April 2, 1878.

HENRY GORE.

#### REVIVIFICATION OF SPENT LIME.

SIR,—In reply to Mr. Owen's inquiries in your last issue, I beg leave to state that my process is quite applicable to gas-works manufacturing 3 millions and upwards per annum. A new series of experiments is presently being conducted, and will be concluded shortly, and the nature of the invention fully reported.

Paisley, April 6, 1878.

G. R. HISLOP.

**INSTITUTION OF CIVIL ENGINEERS.**—At the meeting of this Society on Tuesday, the 2nd of April—Mr. J. P. Bateman, F.R.S., President, in the chair, Mr. Thomas Haak, Engineer to the West Middlesex Water Company; and Mr. Charles John Wood, Bradford Water-Works, were elected as Members. Messrs. Samuel Robert Linging, Stoke-upon-Trent; Edwin Melville Richards, Engineer to the Local Board of Burslem; and George Henry Stayton, Engineer and Surveyor to the Chelsea Vestry, were elected Associates.

**THE RICHMOND VESTRY AND THEIR WATER SCHEME.**—The *Richmond and Twickenham Times* says: "More cash being wanted for the Richmond Water-Works (this time but a modest £4000), a Government inquiry is announced to be held at the Vestry Hall next Wednesday morning. The awkward block at the well, and the Engineer's report, read at the Vestry on Tuesday, suggest that it would be prudent for the ratepayers to be fully informed what reasonable probability there is of the well proving an ultimate success before any more money is borrowed, and on what grounds such pleasant hopes rest. At such a juncture it would be unwise to blink the fact that the ratepayers were positively assured that the well would be completed more than six months ago, and yet, even at this remote period, when the boring is said to be but 2 feet from the chalk, progress is completely blocked, and none of the right water reached. Being possibly so close to the end, it would be unwise to abandon hope; at the same time it is only reasonable and business-like to exactly ascertain the worth of the evidence—the alleged scientific proof—on which such fondly cherished hopes depend." At the meeting of the Vestry on the 2nd inst. the Clerk read the following report from Messrs. Russ and Minns:—"We beg to report that since the last meeting of the Vestry the Contractors (Messrs. Baker and Sons) have been unceasing in their endeavours (working day and night) to remove the obstruction in the well, but up to the present time their efforts have not been successful."

## Parliamentary Intelligence.

### HOUSE OF LORDS.

MONDAY, APRIL 1.

The Examiners reported that no further Standing Orders are applicable to the Farnworth and Kearsley Gas Bill.

Normanton Gas Bill,—reported from the Select Committee, with amendments.

Southport Water Bill,—read a second time, and committed.

York United Gas Bill,—read the third time, passed, and sent to the Commons.

TUESDAY, APRIL 2.

The Examiners reported that no further Standing Orders are applicable to the Torquay Gas Bill.

Newry Gas Bill,—report from the Select Committee read, that the Committee had not proceeded with the consideration of the Bill, no parties having appeared in opposition thereto.

Sevenoaks Water Bill,—reported without amendment.

Burton-upon-Trent Commissioners Bill, Exeter Corporation Water Bill,—read the third time, passed, and sent to the Commons.

Brading Harbour District Gas Bill, Hartlepool Gas and Water Bill,—read the third time, and passed.

Scarborough Water Bill, Shrewsbury Gas Bill,—brought from the Commons, read the first time, and referred to the Examiners.

THURSDAY, APRIL 4.

Warrington Water Bill,—reported from the Select Committee, with amendments.

The Examiners reported that the Standing Orders have been complied with in respect of the petition for additional provision in the South Staffordshire Water Bill. Leave was accordingly given to the Committee on the Bill to insert the additional provision if they shall think fit.

Farnworth and Kearsley Gas Bill, Marske and Saltburn Gas Bill,—read a second time, and committed.

Castleford and Whitwood Gas Bill, Normanton Gas Bill,—read the third time, passed, and sent to the Commons.

Dalton-in-Furness Local Board Bill, East Grinstead Gas and Water Bill, Scarborough Corporation Water Bill, South Hants Water Bill,—brought from the Commons, read the first time, and referred to the Examiners.

FRIDAY, APRIL 5.

Leicester Corporation Bill, Mansfield Commissioners Gas Bill,—committed.

The Examiners reported that the further Standing Orders applicable to the Durham Water Bill have been complied with.

Farnworth and Kearsley Gas Bill,—reported without amendment.

Sevenoaks Water Bill,—read the third time, and passed.

Cockermouth and Workington Water Bill, Lewes Gas Bill, Nottingham Water Bill,—brought from the Commons, read the first time, and referred to the Examiners.

A petition for amendment of the Durham Water Bill was presented from Inhabitants of Durham.

### HOUSE OF COMMONS.

MONDAY, APRIL 1.

Scarborough Water Bill, Shrewsbury Gas Bill,—read the third time, and passed.

Cockermouth and Workington Water Bill, Lewes Gas Bill, Nottingham Water Bill,—as amended, considered; to be read the third time.

Batley Corporation Water Bill (Lords), Bedlington Local Board Water Bill (Lords),—read a second time, and committed.

A petition against the Exeter Gas Bill (Lords) was presented from Corporation of Exeter.

#### TREDEGAR WATER AND GAS BILL.

Mr. RAIKES reported from the Committee on the Tredegar Water and Gas Bill: "That the Committee had not made provision in the Bill for the offer by auction or tender of the additional capital proposed to be raised under the powers of the Bill, as the Company had not been formed for the purpose of supplying gas, and the capital now required for that purpose bore so small a proportion to that required by the general undertaking: That they had examined the allegations contained in the preamble of the Bill, and amended the same by adding a recital showing the estimated cost of the new water and gas works respectively, and found the same, as amended, to be true, and had gone through the Bill, and made amendments thereto."

TUESDAY, APRIL 2.

Truro Water Bill,—reported without amendment.

Limerick Corporation Gas Bill,—reported.

Dalton-in-Furness Local Board Bill, East Grinstead Gas and Water Bill, South Hants Water Bill,—read the third time, and passed.

Deal Water Bill (Lords),—read the third time, and passed without amendment.

A petition against the Forfar Water Bill (Lords) was presented from John Alexander Sinclair M'Lagan; and one against alterations in the Manchester Corporation Water Bill, from Walton-le-Dale Local Board.

#### DUBLIN CORPORATION WATER-WORKS ACTS AMENDMENT BILL (LORDS).

Mr. RAIKES reported from the Committee on the Dublin Corporation Water-Works Acts Amendment Bill (Lords): "That a certificate, under the seal of the Local Government Board of Ireland, was produced to the Committee (under Standing Order No. 173), setting forth that the application for the powers sought for by the Corporation had been made without the sanction and approval of the said Board: That they had examined the allegations of the Bill, and found the same to be true, and had gone through the Bill, and directed him to report the same without amendment."

WEDNESDAY, APRIL 3.

Scarborough Corporation Water Bill,—read the third time, and passed. Bradford Water and Improvement Bill,—as amended, considered; amendments made; to be read the third time.

Imperial Continental Gas Association Bill (Lords),—as amended, considered; to be read the third time.

York United Gas Bill (Lords),—read the first time, and referred to the Examiners.

Lea Bridge District Gas Bill,—reported.

The petitions were withdrawn of (1) Charles Joseph Stonor and others, (2) Justices of the Peace for the County Palatine of Lancaster against the Manchester Corporation Water Bill.

THURSDAY, APRIL 4.

Cockermouth and Workington Water Bill, Lewes Gas Bill, Nottingham Water Bill,—read the third time, and passed.

Nottingham Improvement (Gas, &c.) Bill (changed from Nottingham Improvement Gas and Water Bill),—as amended, considered; clause added; amendments made; to be read the third time.



Burton-upon-Trent Commissioners Bill (Lords), Exeter Corporation Water Bill (Lords),—read the first time, and referred to the Examiners.  
A petition in favour of the Hamilton Burgh Bill was presented from Proprietors and others of Burnbank and Greenfield.

FRIDAY, APRIL 5.

Truro Water Bill,—read the third time, and passed.  
Tredregh Water and Gas Bill,—as amended, considered; to be read the third time.

Exeter Gas Bill (Lords), Forfar Water Bill (Lords),—read a second time, and committed.

Cardiff Water Bill, Hemel Hempstead District Gas Bill, Newbury Borough Extension Bill,—reported.

Public Health Act (1875) Amendment Bill,—reported from Select Committee, with minutes of evidence; re-committed to a Committee of the whole House.

Castleford and Whitwood Gas Bill (Lords), Normanton Gas Bill (Lords),—read the first time, and referred to the Examiners.

Petitions against the Metropolitan Water Supply Bill were presented from (1) Inhabitants and ratepayers of St. Luke's, and members of the St. Luke's and Clerkenwell Ratepayers Association, (2) Inhabitants and ratepayers of Hackney, (3) Inhabitants and ratepayers of Clerkenwell, (4) Inhabitants and ratepayers of Whitechapel.

#### LOCAL GOVERNMENT AND TAXATION IN LONDON.

On the motion for going into Committee of Supply,  
Mr. U. KAY-SHUTTLEWORTH proceeded to move the resolutions in reference to a reform of Municipal Government in London, of which he gave notice on the 13th ult. (See JOURNAL, p. 428.) After calling attention to the anomalous condition of things in the Metropolis, and urging, as a strong reason for attempting to deal with the question, the pledge of the late Government, and the expressed opinions of some members of the present Government. An additional reason was that the present Ministry had, on several occasions, declined to impose additional duties on the Metropolitan Board of Works. That Board represented, not the ratepayers, but the Vestries, in whose election and doings the public at large took little interest. The Vestries never changed their representatives. They were themselves elected at hole-and-corner meetings, and on that ground he did not regard them as representing the ratepayers. He submitted that the members of the Board, thus indirectly elected, were not nearly of so high a class, or of so good a quality, as if directly elected. Many of the members of the Metropolitan Board of Works were small tradesmen; and he believed that 99 out of 100 householders in London did not know the name of their representative on the Board. This ignorance of the name of their representative at the Metropolitan Board of Works was a consequence of the vicious system of indirect election. These men, of whom the householders knew nothing, spent £2,250,000 a year. In public improvements, the Metropolitan Board of Works had spent £2,890,000, which might be reduced to £2,000,000 by re-sales of property. Their indebtedness was close upon £15,000,000, and they had lent to Local Authorities £894,000. Was Parliament to go on heaping duties on a Board like this, or must not London have a real Municipal Government? The Board had not merited undue consideration from Parliament or the Government, for they had resisted useful legislation in reference to the public health, water supply, and gas supply, and on the latter subject had claimed credit for the very legislation they had resisted, and which was based on the Bill drafted by Mr. Beal. The present condition of things involved enormous expenditure in contests before Parliamentary Committees. The cost incurred by the Board for gas fights in ten years had been £104,870; this was exclusive of the sums spent by the City and the Gas Companies. Briefly to recapitulate, London was governed by Vestries that spent between them £4,000,000 annually. They were elected in a corner, and modestly hid their work under a bushel, but their quarrels cost the citizens of the Metropolis many thousands a year. Some one had said, "We are fearfully and wonderfully made, and still more wonderfully are we governed." Referring to the water supply, he advised honourable members, who thought it incapable of improvement, to consult Dr. Frankland's report on the subject. Then, as to gas, who could compare the gas supplied to London with that supplied to Paris? He had himself seen many courts in London, in each of which there was but one stand-pipe for water, and one gas-lamp; and some of the worst of these, he heard, were the property of vestrymen. The practical conclusion which he drew from these and other proofs of incompetence and maladministration under existing arrangements was that the whole Metropolis should be governed under one administrative authority, directly representing the ratepayers, and that the ancient Corporation of the City, if extended over the Metropolis, and remodelled in accordance with present wants, would best achieve the purposes of a municipality. This reform he called on the Government to undertake without delay.

Mr. CHARLEY thought it better that each borough in the Metropolis should be constituted an independent municipality.

Sir J. HOGG maintained that the Metropolitan Board (of which he is the Chairman) had faithfully discharged all the duties confided to them. In his opinion, the present mode of election of the members of the Board worked well, it giving them trained colleagues, who understood their work, in the place of persons who knew nothing about it. If they were butchers and bakers, the more credit was due to them for having raised themselves to positions of eminence. If men of high position and rank and wealth did not choose to direct their leisure and their talents to the public service, the discredit attached to those who did not do the work, and the credit was due to those who did it. If the public did not choose to take the trouble of electing their vestrymen, the responsibility rested with them, and not with the members of the Board. The honourable member had charged the Board with negligence in not providing a better water supply for the Metropolis, but he did not see how that charge could be brought in the face of the Bills which the Board had introduced into Parliament this session. The Board had not adopted the use of hydrants on the advice of their Engineers, who thought they would not be worth the money they would cost. As to Gas Bills, he had been constantly bringing them in ever since he had occupied a seat in the House. The result of the action of the Board was that there had been an amalgamation of the various Companies, the price of gas had been lowered, and he thought this had greatly benefited the consumers. Their Gas Examiners regularly tested the quality of the gas, and Companies who violated the provisions of their Acts of Parliament were promptly called to account. He might mention one instance in which a penalty of £50 was inflicted on a Company because their gas was below the recognized standard of purity.

Mr. JAMES said, in his judgment, hardly anything could be worse than the existing state of things, and he urged various complaints against the manner in which corporation funds were disposed of.

Sir W. FRASER and Mr. RALLI supported the resolutions, and Sir S. WATERLOW, a member of the Corporation, though not professing to speak in the name of that body, said he did not believe there would be any hostility shown by the Corporation to a comprehensive scheme for placing the whole Metropolis under one local authority, assuming that their privileges were "leniently dealt with."

After some remarks in support of the resolutions by Lord ELCHO and Mr. STANSFELD,

Mr. CROSS opposed, and pointed out the difficulties in the way of dealing with the questions involved. He stated, however, that he quite admitted that there were great faults in the government of London. He would go further, and say that there were undoubtedly questions of a pressing nature which must be dealt with. When they found Bills brought forward by the Metropolitan Board of Works for assuming the whole water and gas supply of London, and when they found that a Committee of the House, who sat in reference to the Fire Brigade one or two sessions ago, made a report on the subject, he thought there could be no doubt there were questions connected with the government of London which must be taken in hand. Quite sufficient pressure was thus put on the Government if they thought fit to lay before the House measures dealing with those questions before long. Having said that, he had, he thought said as much as he would be justified in doing. The matters to which he had just referred were such as the Government were bound to take into consideration, and when they did so other matters would of necessity occupy attention.

Mr. LOWE regretted the unsatisfactory character of the Home Secretary's reply, and argued in favour of the Vestry Government of London.

Lord J. MANNERS thought the Home Secretary was right not to pledge himself to any definite course until he saw clearly how the thing was to be done.

Sir C. DILKE could not entirely agree with what had been said on either side, and in particular felt himself compelled to dissent from the statements respecting the social position of many of those who managed local affairs and sat on Vestries. He feared that the conduct of the Metropolitan Board, in declining to accept the decision of a Committee of that House as to the means that ought to be adopted for the prevention of tidal overflows of the Thames, betrayed a good deal of unworthy irritation, and a desire to evade a grave responsibility which had been declared to rest upon them, and that they were still persisting in a course which had done much to lower them in public estimation. On the other hand, the Board were not open to all the charges brought against them.

Mr. NEWDEGATE and Sir G. BOWYER opposed the motion, the latter favouring the idea of federation of municipalities round the City Corporation.

Mr. GOSCHEN defended the late Government for not dealing with the subject, and with regard to the feeling of the Corporation in reference to reform, said it was clear there had been a great change in opinion, and that the hostility to a well-considered scheme was no longer so great as in former years.

Mr. SAMUDA said he did not wish to throw the whole management of such great matters as the gas and water supply of the Metropolis into the hands of a Board, but should prefer to see them managed by men who had devoted their whole lives to carrying them on. It appeared to him to be the greatest possible mistake to propose an abstract resolution on this question, in place of bringing in a well-considered measure on the subject.

The House then divided, when there appeared—

For the resolution . . . . .	73
Against it . . . . .	116

Majority against. . . . .	43
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The resolution was accordingly lost.

#### METROPOLIS WATER-WORKS (PURCHASE) BILL.

On the order of the day for resuming the adjourned debate on the second reading of this Bill,

Mr. FAWCETT said: Mr. Speaker, I wish to ask the Home Secretary a question as to this Bill. The measure is in a most unfortunate position. I have ascertained from the authorities of this House that if a Bill of this nature were brought forward with regard to any other town in England than London, for the purpose of purchasing water-works, it would be a private Bill, and, therefore, it would be subject to an inquiry by a Select Committee upstairs; but, owing to the operation of the half-past twelve o'clock rule, this Bill has not the least chance of ever coming on, unless the Government give some assistance to the promoters. It seems to me that the time has come when the question should be determined, after an inquiry by a Committee of this House, whether it is desirable that the Water Companies of London should be purchased, and if so, on what terms. What I wish to point out to the Home Secretary is this. I am told that a most serious evil is arising from the delay on this question. I am told, on good authority, that there is a great amount of speculation, and of what is called "rigging" the Water Companies shares; and that, if this Bill is delayed, and if the Water Companies are ever to be purchased, the purchasers will have to pay a great deal more for them than they would otherwise have to do. I will not press the right honourable gentleman now for an answer, but I would ask him to say, at any time that may be convenient, whether the Government would offer any objection, if the order for the second reading of the Bill is discharged, to assent to a motion for the appointment of a Select Committee to inquire into the subject. That would serve exactly the same object, and would not embarrass the Government. If the Government would consent to the appointment of a Committee to inquire into the question of the future working and purchase of the Water Companies, I think that would be a very satisfactory arrangement; and, as I said before, I think there is all the more reason for such a course, because, if a proposal of this kind were brought forward for Manchester, Birmingham, or any other of the large towns, it would be brought forward as a private Bill, and would not be opposed, as this Bill has been, on the second reading, but an inquiry would take place upstairs; and I believe that if a private Bill for this purpose were introduced, the feeling of the House would be to send it to a Committee upstairs. I will therefore ask the Home Secretary, either now or on any future occasion that he may prefer, whether he sees any objection, if the order for the second reading of this Bill be discharged, to consent to a motion for the appointment of a Select Committee for inquiry into the subject.

Mr. CROSS: I am quite aware that this question has given rise to considerable discussion as to the purchase of the water-works undertaking of the Metropolis. Is is a practical question, and I should have liked well enough to have had this Bill discussed on the second reading, because there are two questions which it is important to have considered—first, whether it is desirable that the Water Companies should be placed under one management, and that is a question which came to a large extent before a Committee of the House which sat not very long ago. And then there is the second question. Supposing that the Companies are amalgamated, whether the Metropolitan Board of Works are the proper authority under whose management they ought to be placed. I cannot give an answer to the honourable gentleman's question at the present moment, but I apprehend that on some future day we shall be able to consider the matter; and I hope the honourable member will put another question to me then.

Mr. FAWCETT: Yes; I will put it down for any day that the right honourable gentleman likes. Perhaps it would not be convenient to fix a day now?

The SPEAKER: To what day is the order postponed?

Sir J. HOGG: Tuesday next.



## HOUSE OF COMMONS COMMITTEE.

WEDNESDAY, MARCH 6.

*Before Sir LAWRENCE PALK, Chairman; the Marquis of LORNE, Mr. STARKE, and Mr. ERNEST NOEL; Sir JOHN DUCKWORTH, Referee.)*

## CHELTENHAM WATER BILL.

## CHELTENHAM CORPORATION WATER BILL.

(Continued from p. 516.)

Mr. John Henry Boughton, examined by Mr. VENABLES.

I am a Justice of the Peace, Alderman and Deputy-Mayor of Tewkesbury, Medical Officer of Health for Rural Sanitary Authorities, and Surgeon to the fifth Hampton and Derwent districts of Tewkesbury. I remember the introduction of the water supply from the Severn. The chief supply had previously been from wells. I adopted the Severn water for my own use, and that of my family. I am a great water drinker. My experience of the Severn water is that it is very excellent. It is bright to the eye and pleasant to the taste. It is used by some of my patients. I cannot say that I recommend it particularly to them as a panacea; but I prefer the water to that derived from wells. I have never heard any complaints of it from my patients.

Cross-examined by Mr. BROWNE: The wells that we have access to are not particularly shallow. Possibly sewage might get into them. I am not aware that the Severn water has a disagreeable odour. I have not kept any of it standing for a few days to try it. I have only analyzed it in a rough way. No doubt water with sewage in it is bad for domestic purposes. The sewage of Worcester and Upton may go into the river; but I think the Severn water very good to drink. I do not think that the water at Tewkesbury has any sewage matter in it to speak of.

Mr. BROWNE: Would the excreta of cholera or typhoid patients be destroyed in running down the stream from Worcester?

Witness: They might not be altogether destroyed.

If the poison was taken into the system of a person in Tewkesbury, would it not cause the disease which was prevalent up the stream?—I am not prepared to answer that question.

Are you prepared to deny it?—No.

Would it be unsafe to use the water if cholera or typhoid fever existed in the upper towns?—I do not think there would be any fear. I could not pretend to say at what point of the river the noxious character of the water would be got rid of. I should not like to drink the water immediately below the outfall sewer at Worcester, nor a mile below, nor probably five miles.

Is it your experience that water taken from deep wells is much better, so far as organic impurities are concerned, than river water?—I am not altogether of that opinion. I think that the supply of water should be in the hands of a public authority.

Re-examined by Mr. VENABLES: I am not aware that there is any sewage in the water at Tewkesbury. I have never seen or smelt it. I have a constant supply of Severn water, and have, therefore, no motive for storing it. There has been no epidemic of cholera or typhoid fever since the Severn supply has been introduced, but, of course, there have been isolated cases.

Mr. Home, examined by Mr. VENABLES.

I reside at Tewkesbury. I remember the water supply before the Severn water was introduced. There was sometimes a deficiency. The Severn supply has been an improvement, and the water is all I could wish. I know the river well, from boating, bathing, and fishing in it. I have not seen anything like sewage deposit on the banks. During, and after, a flood the water is discoloured. It is filtered before it is drunk. I think that the allegations that have been made as to impurities in the water are entirely incorrect.

Cross-examined by Mr. BROWNE: I have a well on my own premises that is tolerably deep. The Severn water is delivered cool and filtered. I have a filter in my own house, but I often drink the water without filtering it. There is not a large population constantly on the river—I should say not 2000 persons. I cannot say that I have seen many dead animals in the river. I know the Avon; it is much fouler than the Severn. It has two branches, one flowing into the Severn, 500 or 600 yards below the point at which the Company take their supply, and the other a mile and a half below. The Avon is very turbid, and contains a large amount of decayed vegetable matter.

Re-examined by Mr. VENABLES: I should not think that the Avon water has any means of getting to the intake of the Company.

By the CHAIRMAN: I have resided at Tewkesbury all my life, with the exception of a very short interval.

The CHAIRMAN asked the witness if he knew anything of a Bill introduced in 1865, which was opposed by the Commissioners, who introduced a rival plan, and alleged that the water of the Severn was not good. The Bill (the Chairman said) went into the House of Lords, and the Committee determined that a separate supply should be given for drinking purposes in consequence of the Severn water not being considered fit to drink.

Mr. VENABLES said that the Chairman of the House of Lords Committee did not state that the water was bad, but that it was very unpopular, and that it might be injurious to Cheltenham if the notion were to spread abroad that its water supply was one of the best description, however erroneous such a notion might be. The Committee were not prepared to say that the Severn water was unwholesome, but said that there was no doubt a prejudice against it.

Mr. Joseph Walker, examined by Mr. BAZALGETTE.

For the last twelve years I have carried on the business of a chemist and druggist at Tewkesbury. Up to 1870 I was supplied with water from a well, but the water was certainly not satisfactory. I had had three cases of typhoid fever in my family, which I attributed to the well water. Since 1870 I have had no such cases. My family are mainly water drinkers. I do not now use any well water. The Severn water, as supplied by the Company, is bright and pure to the eye, and acceptable to the taste. In times of flood the river is discoloured, but there is no sign of discoloration in the water supplied. During floods there will naturally be more perfect oxidation of the sewage matter coming down the river.

Cross-examined by Mr. BIDDER: The water used by my family is not filtered. I have heard passing complaints, by the Tewkesbury people, of the sewage of Worcester being permitted to flow into the Severn.

Mr. Francis Thomas, examined by Mr. BAZALGETTE.

I am an auctioneer at Tewkesbury. I have been Mayor of the borough, and am still a member of the Corporation, who are the Sanitary Authority for the district. Previous to the introduction of the river supply the health of the town was not good.

Mr. BIDDER said he did not deny that an increased supply of water had been beneficial.

Examination continued: I have never had any reason to complain of the Severn water supplied by the Company. It is a soft water, which is better adapted for domestic purposes than hard water. The well water at Tewkesbury is peculiarly hard. The Severn water is not supplied to every house. There are many small cottages there, and, in my opinion, it would be a great advantage to such houses if that supply were extended to them. I do not have the water filtered in my house.

Cross-examined by Mr. BIDDER: I suppose the owners of the cottages

do not have the water laid on because of the first expense. I think the Corporation have been doing their duty as a Sanitary Authority.

Mr. BIDDER: Only one house in seven has got it. How is it that you have not introduced it generally throughout the town?

Witness: We have not the power to order it until the other supply is found to be too impure for use.

You would like very much to introduce it all through the town?—Yes, I should.

I suppose the Corporation are generally of that opinion?—Yes. The rate is 5 per cent. on the rental, and the charge for closets 4s. or 5s., I fancy. I remember the complaints about the sewage of Worcester polluting the river, and the information that was filed against that Corporation. We had to dispose of our sewage otherwise, and we thought it would only be fair that they should do the same. I do not think it was ever a public nuisance. I never found the river objectionable to the smell. Of course, if I could get it, I would prefer a water that had no suspicion of sewage in it.

Re-examined by Mr. VENABLES: Of course, wherever the water is laid on it has to be paid for. At Tewkesbury, as well as other places, owners, if they have another supply, do not like to have to pay for a supply. We have not the power of enforcing the distribution of the Company's water until there is an actual deficiency of wholesome water in any poor house.

Mr. T. McKay, examined by Sir E. BECKETT.

I am a builder at Tewkesbury. I used to drink water from the wells, until about seven years ago. I was in bad health for some time previous to the introduction of the Severn water. I suffered from an affection of the kidneys. Since the Company gave a supply from the river I have been very well. I drink that water, and it has agreed with me. It also agrees with the kettles very much better than the well water did.

Mr. Wood, examined by Sir E. BECKETT.

I reside at Lansdowne Villa, Worcester. I am an Alderman of that borough, and Chairman of the Water and Sewage Committee. They get their supply from the river. It is very good water. I have never heard any complaints of a serious character. Sometimes in floods there is a discoloration of the water; but we filter it, and that almost entirely gets rid of the discoloration. The discoloration is caused by the peat lands, and every one knows that that is not unwholesome. The population of Worcester is from 33,000 to 35,000. The water is generally taken throughout the town. I was formerly a builder, and I have found the river water very good for boiler purposes.

Cross-examined by Mr. BIDDER: The Corporation supply the water in Worcester. I have always considered it an advantage to have the supply in the hands of the Corporation, as they are then more free to carry out sanitary improvements. The sewage of Worcester runs into the river at a point about three-quarters of a mile above our sewage outfall.

Mr. Francis Dingle, examined by Mr. BAZALGETTE.

I am Mayor of the city of Worcester at the present time. The water-works are vested in the Corporation. The supply is taken from the Severn. My own house is furnished with that supply. I had used the Severn water for years before taking the house in which I now reside; but I have now a well which the county analyst examined and pronounced good, and therefore my family chiefly drink the water from that well, as it is cooler in summer than the river water. We, however, use the river water as well.

Mr. Southall, examined by Mr. VENABLES.

I am Town Clerk of Worcester. The supply of water at Worcester is very satisfactory. I am Clerk to the Severn Commissioners, and frequently go up and down the river. Between Worcester and Tewkesbury the river is a very clear, good stream. There are no deposits on the banks. When you get below Tewkesbury, however, the banks are very muddy. As Town Clerk, it was my duty to answer the information which was filed against us in 1872. The discharge of sewage into the river did not create a public nuisance or pollute the river. Fine and clean-eating fish are frequently caught immediately opposite the mouth of the outfall sewer. My answer to the information was founded on analyses taken by Dr. Letheby. In his report, after stating the result of his analyses, he said: "It is evident from this that the natural purifying and oxidizing power of the stream, aided as it is by enormous dilution, is amply sufficient to destroy organic impurities entering the river above Tewkesbury." He added that the water was practically of the same chemical composition at both Worcester and Tewkesbury, and that when it was clarified by subsidence and filtration, it was excellently well suited for domestic use and town supply. The proceedings against us were in 1872. Nothing has been done in the matter since we filed our answer, which we considered settled the question. At all events, they have not taken any further steps.

Cross-examined by Mr. BIDDER: Our answer was perfectly *bona fide*, and I have no wish to cast any imputation upon the *bona fides* of the Corporation of Tewkesbury in filing the information. The Bill filed by the Tewkesbury Corporation has not been dismissed. I do not know what motives the complainants had to induce them not to proceed, but it is by no arrangement with us that it stands over. I do not suggest that all water in which fish can live is fit for drinking; but the fact that fish can live in water is some proof of its purity.

Re-examined by Mr. VENABLES: Shrewsbury and Kidderminster at that time poured their sewage into the river. The latter town has, however, now a sewage farm.

By Mr. NOEL: We do nothing to filter the sewage. The whole of it goes into the river unfiltered, the solids as well as the liquids. We have no sewage-works of any sort.

Dr. Strange, examined by Mr. BAZALGETTE.

I have practised in Worcester for about 24 years. Previously I lived at Bridgnorth, which is also on the Severn, and the river water is used there. In 1865 I gave evidence against the Cheltenham Water-Works Company's Bill, which proposed to supply Severn water. I considered then that the Severn water would not be so good as the spring water, which the Commissioners proposed to supply to Cheltenham. In the year 1873 I was appointed Medical Officer of Health for the city of Worcester. Since then it has been my duty to investigate pretty closely the quality of the water supplied to the town. Very few wells are now used there. I found that the wells were greatly polluted, particularly in the more thickly built parts; and on testing the Severn water I found that it was very much superior to that from the wells in a general way. I therefore advised the Sanitary Authority to do away with the wells in all the most populous parts of the town. I now consider the Severn water of sufficient quality for the supply of the town. It has been very much improved since 1865. The sewage from towns above Worcester has been diminished. There was at first a prejudice against the tap water for drinking, but the people now generally use it, and it has conduced to the health and comfort of the town.

Cross-examined by Mr. BIDDER: When I became Medical Officer of Health I found that many persons in Worcester were drawing their water supply from shallow wells; and, although bright and sparkling, from their proximity to cesspools they were fearfully polluted in many cases. As compared with that water, I considered that the Severn water was more wholesome. In my judgment the river is a perfectly satisfactory and



unexceptional source of supply. I do not now hear complaints of the smell of the Severn water. The water has been very much improved.

Mr. BIDDER: What have they done at the works?

Witness: They have enlarged their filtering-beds.

They take a little more of the nastiness out of it?—In my opinion the filtering, as it is now carried on, is very much superior to what it was. I think the chemical analysis of the number of grains to the gallon is a test of the safety of water for sanitary purposes, with the exception of any disease germs. That, no doubt, is a very important exception; but the same might be found in wells. I believe that the purification of water by its passage down a river, and by oxidation, is much greater than I thought it was in 1865. No chemical analysis that I am aware of will show the existence of germs of disease in water.

Supposing, for instance, you had a fearful epidemic of cholera at Worcester, no analysis of the water at Tewkesbury would show whether there were cholera germs in the water or not?—I do not think it would.

I think that you, as a physician, would say that, although chemical analysis has pronounced a water to be pure, persons drinking that water might be affected by the cholera germs?—Oh, yes; but, of course, it depends very much on the number.

A single germ is enough?—Not if you don't catch it.

Re-examined by Mr. VENABLES: These disease germs are a mere scientific hypothesis. A great many people think there are no such things. To a certain extent, I belong to the school of scientific men who do believe in them; but I know that Dr. Letheby held an opposite view. I am now pretty well satisfied that I was wrong in my view with regard to oxidation in 1865, inasmuch as our own water at Worcester is pure, notwithstanding the sewage of the towns above. I think it is only natural that the water should be pure at Tewkesbury. The water at Worcester is perfectly good to drink.

Mr. Purchas, examined by Mr. VENABLES.

I am the Engineer of the Worcester Water-Works. We filter the water with gravel and sand. The discharge of the sewage of the city into the sewers will have to cease, and a Committee have been appointed by the Corporation to inquire into the best means of diverting the sewage from the river, and when it is removed; whatever injury may be supposed now to arise will cease.

Cross-examined by Mr. POPE: I was Engineer to the Corporation in 1865. The greater portion of the houses in Worcester drain into the Severn. Last autumn I was a resident in Cheltenham. I lived in Clarence Parade, which is a pretty good part of the town. We had water from the well. I remember an interview that I had with Dr. Wright, the Medical Officer of Health, and telling him that the supply was scandalous, and that I could not get a drop of water after four o'clock in the afternoon. That, however, was quite an accidental circumstance. It never happened before, and never happened since, to my knowledge. I only lived in apartments, and therefore I did not know whether there was a constant supply.

Mr. NOEL: Do I understand that you have a Committee now sitting for proposing a plan for getting rid of the whole sewage that now falls into the Severn?

Witness: Yes.

With the intention of carrying out some works that may be devised for disposing of the sewage?—Yes.

That is on account of the Pollution of Rivers Act?—Some years ago I was instructed by the Corporation to make a report, and I visited almost all the towns in England, and made a special report as to what I considered the best means of disposing of the sewage so as to prevent it going into the river.

Re-examined by Mr. VENABLES: At Cheltenham the grievance is that there is no water to be had, not that the quality is not good.

Mr. Henry Davies, examined by Mr. MICHAEL.

I am a librarian at Cheltenham, and proprietor of the *Looker-On* newspaper. I have resided in Cheltenham 50 years, and during that time I have been acquainted with all public matters relating to the town. I was at one time Chairman of the Commissioners, and a member of the Finance Committee. On several occasions the Commissioners gave notice to the Water-Works Company to supply a larger amount of water. I think the introduction of the Severn water into Cheltenham will be a great deal better than the sand-bed water. The present supply of water is insufficient for the purposes of Cheltenham. At present the streets are watered with water obtained from the Company, but the sand-bed water would do very well for that purpose.

Mr. POPE: We do not propose to set up the sand-bed water at all. We quite agree that that is not a fitting supply.

Examination continued: We had a report from our Borough Surveyor, Mr. Humphris, on the subject of the water supply, and my impression is that this report was to the effect that the supply from the slopes of the Cotswold would be wholly insufficient for the wants of Cheltenham, even as it then was, and it is constantly increasing. I am satisfied that any temporary attempts to get water from that source would be mere patch-work, and that we ought to go somewhere where we can get a never-failing supply. I do not think there is so much prejudice now against Severn water as existed previously. If the Corporation buy the water-works, they will supply Severn water. They take powers in the Bill to supply it to any one who will buy it. Cheltenham is extending, and a copious supply of good water would be of very great service to the town. I have tasted the Tewkesbury water, and it is as good water as I should like to drink.

Cross-examined by Mr. POPE: Even if we could get a sufficient supply from the hills, I do not know that I should prefer it to the Severn water. So far as my own opinion in the matter goes, I would as soon drink the one as the other; and for domestic purposes, such as washing, the Severn water is infinitely better. I might have been the proposer of a resolution at Cheltenham recommending that the water supply should be in the hands of the Corporation. I have changed my opinion in regard to the supply, as I prefer an unlimited supply for all time to a limited supply which in a few years might be exhausted.

Mr. Wm. Jones, examined by Mr. MICHAEL.

I am a Magistrate of the county of Gloucester, and have resided in Cheltenham about 21 years. My family possess about two or three miles of fishing rights on the river. I have a farm of nearly 1000 acres, and am well acquainted with the neighbourhood of Cheltenham. [Witness then gave evidence as to the nature of the land at the sources of the streams in the Cotswold, and said that a supply from the Severn would be a great boon to the inhabitants.]

Mr. David Hartley, examined by Mr. MICHAEL.

I am a member of the Royal College of Surgeons, England, and have resided at Cheltenham about 35 years. A large number of the houses there are built on the clay, and have no other water supply than that provided by the Company. It would be a great advantage to them to have more water. As a medical man, I see no objection to bringing the Severn water to Cheltenham. I have tasted the Tewkesbury water, and think that if it were brought to Cheltenham the inhabitants would avail themselves of it. It would be a great boon to them to have an ample supply.

Cross-examined by Mr. POPE: The only objection to it is that there is a very strong feeling against it.

Mr. Cotile said he had practised as a surgeon in Cheltenham for 43 years. The whole of the town should have an ample supply of water, more particularly that which was not at present supplied from the works. The Severn water supplied at Tewkesbury was bright, clear, sparkling, and very wholesome, and, if supplied to Cheltenham, would be a great boon to the inhabitants. He had never heard from his medical brethren of any bad effects in Tewkesbury since the introduction of the river water. It would be better than was now supplied at certain times. He did not think the prejudice against it was so great now as formerly.

(To be continued.)

## Legal Intelligence.

SURREY ASSIZES, KINGSTON.—THURSDAY, MARCH 28.

(Before Lord COLERIDGE and a Special Jury.)

THE QUEEN, ON THE PROSECUTION OF THE BOARD OF WORKS FOR THE WANDSWORTH DISTRICT, v. WALLACE.

This action was tried at the last Surrey Assizes, at Croydon, before Justice Grove, when, the Jury being equally divided in opinion, there was no verdict. The present indictment was therefore brought against the defendant. The Wandsworth Board of Works have applied for an injunction in Chancery to restrain the defendant from continuing the nuisance complained of as being caused by his works, but it was postponed till the first trial day in April. The Board offered, before the present case came into Court, that if the defendant would pay the costs of the last trial they would abandon their claim, and simply ask for a nominal penalty. The defendant refused the offer, preferring to have a trial in the Court of Chancery.

Mr. MORGAN HOWARD, Q.C., and Mr. F. J. SMITH appeared for the plaintiffs; Mr. MURPHY, Q.C., Mr. GRANTHAM, Q.C., M.P., and Mr. BRAY for the defendant.

On the case being called on,

Mr. MORGAN HOWARD said that he understood the defendant intended to plead guilty to the indictment.

Mr. GRANTHAM said that his learned friend was quite right in his supposition. More than two years ago the indictment was drawn up, and since then a great deal of money had been spent by the defendants endeavouring to remedy the inconvenience likely to follow from the carrying on of works of this kind; and, looking to the fact that there were proceedings in the Court of Chancery as to the state of the works, he thought it was desirable that whatever litigation there was should be taken upon the existing state of the works rather than on what it was two years ago. There was a difficulty, of course, in saying when an unpleasant smell became a legal nuisance. The defendants were willing to be placed under the supervision of chemists or scientific men, to see whether anything more could be done; and, if not, in a stated time a certain portion of the work would be given up. If that could be done, he thought he was justified in saying that the scientific witnesses called on behalf of the plaintiffs would not disapprove of it. Looking at all these circumstances, he thought it was better that the defendants should adopt the course they did. With regard to the works themselves, they had been in existence there as chemical works for 70 years. No doubt, some few years ago another class of work had been added—namely, the using up of the refuse from the gas-works. That was done in closed pipes, and every effort had been made to carry that manufacture on in such a way as to avoid any nuisance to the neighbourhood. It was quite possible, however, that accidents might occur which could not be avoided; but defendants were willing to allow the works to be carried on in any way that was thought desirable. They must be carried on somewhere, as they were works of necessity and public interest. He had said advisedly the “defendants,” because there were really two defendants—Mr. Hugh Wallace, the father, and Mr. William Wallace, the son, who was indicted along with his father. No doubt young Mr. Wallace superintended the works up to a certain time; but six months before the actual trial came on he had ceased to have any connection with the works, and was now employed at Soho. The defendants were quite willing that the work should be carried on in the way that had been mentioned—under the supervision of a chemist to be agreed upon either by the plaintiffs or by the Court.

Mr. MORGAN HOWARD said he had thought it better to abstain from the merits of the case, but the nuisance had existed for a considerable time; and in the view of the Board, and of the medical and chemical witnesses to be called on their behalf, it was considered to be a most serious and objectionable nuisance to the health as well as to the comfort of the inhabitants of the district. With reference to subsequent proceedings, the plaintiffs would pray the judgment of the Court of Queen's Bench in the ordinary way, and would, therefore, not trouble his lordship with any evidence on the question.

The plea was then formally withdrawn, and a plea of guilty entered on the record.

THE QUEEN, ON THE PROSECUTION OF THE BOARD OF WORKS FOR THE WANDSWORTH DISTRICT, v. THE ALUM AND AMMONIA COMPANY, LIMITED.

The hearing of this case was then proceeded with, the same Counsel being engaged as in the previous one.

Mr. MORGAN HOWARD, in opening the case for the plaintiffs, said that the proceedings had been taken, by way of indictment, at the instance of the Board of Works for the Wandsworth District, against the Alum and Ammonia Company, for a nuisance carried on at their works at Lombard Road, Battersea, and he thought, after hearing the evidence, the Jury would be of opinion that it was a case involving a very serious charge against the defendants, because, if he was rightly instructed, the nuisance which had been carried on at these works for some considerable time past, was of a character to diminish to a very serious extent the comfort and purity of the air to which people were entitled, under the law, in the houses and places of business. The Board of Works had no kind of personal interest whatever in these proceedings. They were instituted simply in the discharge of a public duty which had been forced upon them by the repeated and urgent complaints and representations of the inhabitants. The facts that would be brought before the Jury would enable them to say by their verdict that, if the works were not to be removed, they should be so conducted that those residing, and having their places of business in the neighbourhood, would in future be free from the nuisance of which they complained. The law was strict enough to say that if the works were a nuisance, and it could not be remedied by the application of contrivances, scientific or otherwise, they could not be carried on in that district. On the other hand, if the trade could be carried on by scientific measures, in such a way as to prevent the nuisance from being continuous, then the defendants were bound so to do, and to remove the grievances complained of. The Alum and Ammonia Company were manufacturers of ammoniacal salts, which were largely used for manure. The process was this: For the purpose of getting the ultimate product, they saturated



fine deal sawdust with sulphuric acid. Certain acid fumes were given off at this stage of the process, which were very objectionable. After that there was an application of gas required for the purpose of extracting ammonia, ultimately resolving itself into ammoniacal salts. At the time he was more particularly speaking of, when the sawdust was saturated with sulphuric acid, it generated a great amount of heat, and threw off a quantity of obnoxious fumes, and in certain conditions of the atmosphere those fumes were distributed over a considerable portion of the district, and formed a very serious nuisance to many persons resident there. The Company had made their appearance in the Lombard Road, Battersea, after migration from the Nine Elms District. From that district they came with no good character in the particular matter complained of, and the Battersea people liked the nuisance quite as little as the Nine Elms people. The Company removed to the Battersea district in 1872 or 1873, and from that time to the time the indictment was preferred, they were a source of annoyance to the inhabitants, more particularly about the summer of 1872, when the process of making the ammoniacal salts was perfected. There was no desire on the part of the Board to do anything that would interfere with the works; but they were so remonstrated with by the inhabitants that it was impossible for them to abstain from taking some kind of action, and they put themselves into continuous and even friendly communication with the Company, in order to get them to endeavour to discontinue the nuisance. The result was that the services of chemical men of great repute were, from time to time, called in, and efforts were made by the defendants, to a certain extent, to endeavour to remedy the evils complained of; but when the indictment was preferred, they were not remedied, and the nuisance remained. On the part of the Board, he was perfectly willing and desirous, without any kind of reserve, that every document and every report should be put in, either favourable or unfavourable to the Board, in order that the Jury might arrive at a sensible and satisfactory conclusion as to the charge in the indictment. On May 29, 1873, Mr. Oakman, the Medical Officer of the Board of Works, having been asked by the Board to look into this matter, reported to the Board that he had made an inspection of the Company's works, and that the manufacturing process carried on there was the saturating of pine deal sawdust with sulphuric acid. This was done by mixing the sawdust with sulphuric acid in a leaden chamber. When thoroughly saturated, it was then conveyed in covered waggons to the gas-works, where it was utilized to extract ammonia from the gas. It was then returned to Lombard Road in the same covered waggons, and stored for sale, and was not submitted to any further process at the factory. He also stated that neither ammonia nor alum was manufactured at the works. In the above process there was no refuse, and nothing whatever found its way into the sewers. Fumes of an acid pyroligneous nature were given off, which he considered rather beneficial than otherwise. In conclusion, Mr. Oakman recommended that the Company be requested to build proper storage rooms sufficient to keep the whole of their manufacture under cover, as a considerable quantity was lying in the open air giving off its vapours. This, he thought, would entirely mitigate the nuisance complained of. On the 30th of May following, the Board, through their Clerk, addressed a letter to the defendants, asking them to give effect to Mr. Oakman's recommendation. Pending that state of things, there was a very urgent representation made to the Board of Works by Miss Unwin, a lady living in the neighbourhood of the works, stating that the horrible smell arising from the works was almost unbearable, and that it impregnated the whole of her house. On Dec. 20, 1873, Mr. Oakman, at the request of the Board, made another report, in which he stated that he had carefully inspected the works on three separate days, on two of which the processes were in full operation. The first process consisted in the mixing of sawdust with sulphuric acid for the purpose of extracting ammonia from the gas at the gas-works, and the second in the extraction of the ammonia from the saturated sawdust. In the first process fumes of an extremely acid nature were evolved, which were very powerful on the occasion of his second visit when the process was in full operation; in fact, it was almost impossible to stay many minutes in the building. Outside, however, when mingled with the atmosphere, he could not discern anything in connection with the process which could be considered at all injurious, though he could readily understand in thickened conditions of the atmosphere, when the fumes could not readily escape they would be considered a nuisance by the inhabitants of the adjoining district. In the second process, the sawdust, when returned from the gas-works, was so saturated with gas that the atmosphere around the works was strongly impregnated with it on his second visit. This was accounted for when a larger quantity than usual returned, owing to a strike amongst the men preventing the Company from removing it for some days previously, so that it had accumulated; but still, whether it was much or little, it emitted a disagreeable odour of gas. In the crystallization of the ammoniacal salt, the steam driven off carried with it some gaseous hydrocarbon, which was doubtless the cause of complaint. Mr. Oakman then suggested—first, that the returned sawdust from the gas-works be placed under cover on its arrival at the works; secondly, that the evaporating pans be kept covered; thirdly, that the present most inefficient "pan of fire" be replaced by bars, and a furnace placed in such a way that the vapours from the evaporators might pass through ignited fuel in the furnace. In this report, Mr. Oakman expressed his acknowledgment of the courtesy shown him by the foreman of the works; so that there had never been any concealment. Whether the Company had attempted to carry out the suggestion to pass the escaping gases through a furnace so as to destroy them, he did not know, but the desired result had never been accomplished. The nuisance continued, and the discomfort to the people remained. A copy of the last-mentioned report was sent by the Board to Miss Unwin and the Company. There were then further serious complaints of the nuisance, one of these being made by Mr. F. A. Chicker, of Bridge Road, Battersea, and on the 26th of May, 1873, Mr. Buckman, C.E., and Mr. Oakman, at the request of the Board, inspected the Company's works, accompanied by two of the Directors. The Directors on that occasion expressed themselves desirous that Dr. Letheby should inspect their process of manufacture, and said they were quite ready and willing to carry out any improvements or suggestions Dr. Letheby might recommend for the suppression of the nuisance; but as Dr. Letheby had, on a previous occasion, inspected the works at the request of the Board, the Company gave the Board the option of again calling him in. He believed that Mr. Oakman subsequently saw Dr. Letheby, and on the 25th of June a report was read to the Board from Mr. Oakman, stating that, at the works, he had met Dr. Letheby, who advised—first, that the evaporating sulphate of ammonia pans be covered with tight-fitting covers, and that the steam be condensed in proper condensers prior to the passage of the vapours into the furnace-shaft; secondly, that the mixing of the sawdust and the acid be conducted in an air-tight chamber, ventilated into the furnace-shaft; and thirdly, that as large a per centage as was possible of the old material be used with the sawdust, so as to diminish the heating effect. Mr. Oakman agreed with Dr. Letheby's recommendation, but was of opinion that No. 2 did not go far enough, for the reason that it was not during the mixing of the sawdust and acid in the chamber that acid fumes were given off to any extent, but that it was after it had been

thrown from the chamber on to the floor of the building, where, in a few hours, a great heat was generated, which converted the sawdust into a charred mass, and drove off immense volumes of acid fumes, which impregnated the air of the neighbourhood, and which was required to be kept in a closed chamber and ventilated into the furnace-shaft. Mr. Oakman also suggested that the height of the shaft, which was 60 feet, might be very advantageously increased, and that the returned sawdust from the gas-works should be kept under cover. A copy of that report was furnished to the Company. On the 20th of January, 1874, Mr. Oakman again reported that, from inquiries, he found that the alum and ammonia works were the works complained of as being the cause of bad smells, but that there were other sources from which disagreeable smells arose—such as sewers in the neighbourhood. The recommendations of himself and Dr. Letheby had all been carried out at the alum works, with the exception of the fixing of tight-fitting covers to the evaporating pans, which were absolutely necessary, and which the foreman told him should be done, when he trusted the nuisance would be considerably lessened, though he feared it would be impossible to carry on the works without smells being emitted. In the same month the Board had a report from their Medical Officer, on the subject of offensive smells in the neighbourhood, whereupon it was resolved by the Board that the Clerk be instructed to write to the Company, asking them to fix the tight-fitting covers to the evaporating pans. In February, Mr. Oakman reported that the covers for the evaporating pans were completed and fitted. On the 18th of February, the Vestry called the attention of the Board to the nuisance, and on the 23rd of the same month, Mr. Oakman made a further report, stating that the covers to the evaporating pans at the works had been fitted and seen by several members of the Battersea Local Committee, and that it would now be impossible for the steam from the evaporating liquor to immediately find its way into the atmosphere; but that it must pass through a fire into a shaft 60 feet high, but that time would show whether or not this would have the effect of relieving the immediate neighbourhood of the offensive smells, and depositing them at a greater distance. It would be found that this had not the desired result; the gases still escaped, and the nuisance was not abated. On the 3rd of March, Mr. Oakman reported to the Board that he had visited the works twice in the night, at 3 a.m. and 5 a.m., and also in the afternoon, and that he found them in the same condition as when inspected by the Committee, all the evaporating liquors passing up the shaft, and since that had been so the nuisance had been abated. There was nothing new to complain of. At that particular time there was a very slight complaint from the inhabitants; but that was only a blissful moment. The state of things did not last; the old nuisance recurred and continued, notwithstanding all the appliances which had been suggested, and which, to a certain extent, had been carried out. On the 4th of March, 1874, Mr. Oakman made a special report to the Board, a copy of which was forwarded to the Battersea Vestry. The Committee found the recommendations of Dr. Letheby carried out, but sufficient time had not been given to test their efficiency. In accordance with instructions, Mr. Oakman again, on the 17th of March, inspected the works, and found the nuisance still very bad, the atmosphere being impregnated with the fumes of the manufacture, and he recommended the Board to take means for its suppression. On the 18th of March the defendants manager wrote a letter to the Board with reference to the sewer in Lombard Street. There were works not far from those of the Company carried on by Mr. Whiffen, who was a manufacturer of strychnine. In the manufacture of that article, certain products were got rid of into the sewer, and it appeared that at that time the sewer was stopped up; but it would be found that that had nothing to do with the smells from the alum and ammonia works, and in the letter that was written, it was not suggested it had. The fumes that emanated from the strychnine manufactory were of a wholly different character, both as regards their operation and smell, from those of the Alum and Ammonia Company's works; and the one could not be mistaken for the other. Whilst the acid fume of the alum and ammonia works was pungent and irritating, with a definite and ascertained odour of its own, the smell from Mr. Whiffen's works was totally dissimilar, and represented more than anything else the smell of half-burnt cocoa, or strongly-burnt coffee. Whatever might be the merits of the present case, the Alum and Ammonia Company would not seek to shelter themselves behind Whiffen's manufacture of strychnine. He thought it best to mention this in order to eliminate Mr. Whiffen from the case. Mr. Whiffen had been for many years in the district, and there had been no complaint of smells from his works. A Committee were subsequently appointed to inspect the works, consisting of Mr. Oakman, Mr. Kempster, Mr. Alfred Taylor, and Dr. Carpenter. On the 31st of March, Dr. Carpenter wrote a letter, in which he stated that the Committee did not find evidence at the ammonia works sufficient to account for the whole of the nuisance that was said to exist in the Lombard Road, and that to some extent it was indicated by the open sewer. Mr. Oakman, on the 30th of March, also reported to the Board unfavourably as regards the sewer, stating that a dog which had smelt its contents had died. At that time the sewer was open to very considerable objection, but this had nothing to do with the question at issue; he only mentioned it in fairness to the defendants. On the 6th of April, Dr. Carpenter made his report, in which he stated that some nuisance existed which appeared to him to have a twofold source. One was evidently associated with gas manufacture, but the other, though undecided in its character, was of a more nauseous description. He gave it as his opinion that the refuse at the works ought not to be left in the open yard exposed to the wind, and strongly advised the furnace chimney to be raised, so that the matters contained in the solution of ammonia would be kept in a high atmosphere a few moments longer, and have more chance of oxidation before they reached the surface of the earth.

Mr. MURPHY said he quite agreed that the smell arising from the strychnine works was different from the smell from the alum and ammonia works. The only reason the report could become valuable was that there were many smells in the neighbourhood, and the one might be mistaken for the other.

Mr. MORGAN HOWARD said there would be evidence to distinguish one from the other, and separate the question from Mr. Whiffen altogether. On the 11th of April, Mr. Oakman, in a joint report with Dr. Carpenter, said he agreed with Dr. Carpenter's report, and his recommendations, and Dr. Kempster also reported that he agreed with Dr. Carpenter generally. He found that the smell at the alum and ammonia works was caused by the escape of sulphurous and pyroligneous acids, which were injurious to the respiratory organs, and although not altogether conducive to disease, were a nuisance to the neighbourhood. The Clerk to the Board addressed a letter to defendants in December, stating that the Board continued to receive complaints of the nuisance, and that, unless it was remedied in 14 days, steps would be taken to remove it. On the 18th of April the Alum and Ammonia Company wrote, acknowledging the receipt of the letter, and denying the existence of the nuisance at the works "now, or at any former period;" "but that, in deference to the Medical Officer, they had made various additions to their plant, and the Directors would, no doubt, take into consideration any further suggestions from the same quarter, but any compliance with such suggestions must not be construed into the admission of the existence on the premises of a nuisance, as alleged in the letter received from the Board." That letter was read to



the Board, and deliberations took place upon the state of things, whereupon it was unanimously resolved that the report of Dr. Carpenter and the Medical Officers should be sent to the alum works, which was done on the 1st of May. On the 24th of May there was a report from Dr. Letheby to the Secretary of the Alum and Ammonia Company, stating that alterations and improvements had been made in accordance with his own and other suggestions, that there was no escape of offensive matters, that he saw no reason for alterations, and that the shaft was quite high enough. The nuisance continuing, the Board sought assistance from further chemists of repute. They were anxious that everything should be done which could be done to get rid of the nuisance, and they put themselves in communication with Mr. Keates, a consulting chemist, who, after having reported, in July, 1874, as to the operations carried on at the works, gave it as his opinion that there was nothing that could be construed into a nuisance at the time of his inspection. After making various suggestions by way of remedy, he concluded by saying that if the operations at the alum and ammonia works were conducted with care and attention, there need not be any nuisance arising to the neighbourhood.

Mr. MURPHY: His recommendations were carried out.

Mr. MORGAN HOWARD said they could not have been, because the nuisance still existed. In July, 1875, the people in the district continued to complain that the nuisance was both inside and outside their houses, and disturbed them even in their beds, and the Board were consequently moved to take some action to put an end to this state of things. The complaints being renewed, a summons was taken out, returnable at the Wandsworth Police Court on Aug. 24, 1875, under the Nuisances Removal Act, 1855, suggesting that the Company had not used practical means to remove the nuisance. That summons was adjourned, at the request of the Board, to the 12th of November. On the 11th of November, Mr. Oakman wrote to the Clerk of the Board, stating that the suggestions of Dr. Carpenter and Mr. Keates had been carried out, and that there was no necessity for pressing the summons at present. Notwithstanding the abandonment of those proceedings, Mr. Oakman reported to the Local Committee that the nuisance existed to the 12th of November; and that was the day, singularly enough, when the summons was returnable. On Jan. 6, 1876, Mr. Oakman again wrote, complaining of the nuisance, and on the 12th the Manager of the Company wrote to the effect that the apparatus broke down, and could not be got into operation; but that it was then all right, and he trusted there would not be any further complaints. The Board considered the matter, but complaints continued to be repeated, and serious, on the part of the inhabitants. The Board did all they could to get rid of it, but failed in their endeavour to bring the matter to a satisfactory conclusion by the proceedings at the Police Court; and the inhabitants sent in a formal memorial, stating that the nuisance, instead of being abated, still existed, and continued to increase to an intolerable extent, and, if unchecked, would cause an amount of annoyance and sickness in the neighbourhood, and tend to depreciate property. It was headed by the Vicar, and supported by other clergy and inhabitants; and eventually, it being impossible to bring the matter to a satisfactory end, the present proceedings were instituted by the Board of Works for the Wandsworth District in their ministerial capacity. They were undertaking a public, but an unpleasant duty. It would be said by the defendants that they had done a great deal, and had endeavoured to follow out the advice of the medical men and chemists who had been consulted, and he (Mr. Morgan Howard) would be quite willing to believe that they had endeavoured so to do; but he thought it was impossible that it could turn out that they had eventually done so, because the case of the plaintiffs would be that when these amendments were being made, the nuisance continued; and that when, according to the view of the defendants, the improvements arrived at perfection, the nuisance still continued, and led to the sending in of the memorial to which he had referred, which had only one object in view—namely, to restore the neighbourhood to a decent condition, and retain the purity of the atmosphere. He was quite aware that, in the interest of trade and manufactures, these proceedings would be watched—and properly watched—with care and attention, and even with a certain amount of jealousy. But, on the other hand, when manufactures, although useful for all purposes, were carried on, and noxious fumes were emitted, which consisted of daily and almost of hourly nuisances to a district, the suggestion presented itself whether life and health, and ordinary reasonable comfort, should not be preferred to these, and that such manufacturers must betake themselves—as they had been in many cases obliged to do in recent years—to other districts where they could, with almost a minimum of discomfort and annoyance and injury, carry on their trade for the benefit of themselves and shareholders. The law was very jealous as to the happiness and health of the people, and it was also very jealous of their commercial prosperity; it desired to extend and control both; but if there was to be a selection between one and the other, the law gave preference to the health of the people.

Lord COLERIDGE: I do not quite gather whether you say that, do what the defendants will, this is a nuisance, or that they have not done all they can to remove it.

Mr. MORGAN HOWARD said he thought it would turn out that they had not done all they could; but, if they had not, the law would be plain upon the subject.

Evidence was then called in support of the learned Counsel's statement.

Mr. A. A. Corsellis, examined by Mr. SMITH.

I am Clerk to the Board of Works for the Wandsworth district, and have been so for 22 years. I produce the originals of the reports that have been referred to in the learned Counsel's speech. The most important of these have been communicated to the defendants. In May, 1872, there was a communication from Mr. Oakman, who is the Medical Officer of the district. It was in reference to a complaint made about the works. There were other reports, dated the 11th and 20th of December, 1872, upon the complaint of a lady residing in the neighbourhood. The latter report was the one which described the process, and made certain recommendations. It was forwarded to the Board. We received a complaint from a Mr. Chicker, and Mr. Oakman again reported to the Board on the 14th of May, 1872. There was also a joint report by Mr. Oakman and Mr. Buckham, who is since dead. On the 25th of June, 1873, we received another report from Mr. Oakman, embodying a letter from Dr. Letheby to Mr. Oakman. On the 27th of June, 1873, there was a letter from the Clerk to the defendants, enclosing a copy of that report. On Jan. 24, 1874, another report of Mr. Oakman's was presented to the Board. There was a communication from the Battersea Vestry, in consequence of which Mr. Oakman made another report on the 23rd of February, recommending means for abating the nuisance complained of. On March 3, 1874, Mr. Oakman again wrote to the Board saying that since the evaporation escaped through the shaft there was nothing to complain of. On March 17, 1874, Mr. Oakman reported that the nuisance was very bad. Dr. Carpenter was called in to give advice, and the Board had a communication from him on the 31st of March. The power passed Mr. Whiffen's premises. Something had gone wrong there. There was a complaint made that there was a stoppage caused by Whiffen's works, but the whole thing had been remedied, and there has been nothing complained of since. On the 6th of April, Dr. Carpenter made another report, which was printed and sent to the defendants in the ordinary course. I

produce Mr. Oakman's report of April 11, 1874, and also the report from Dr. Kempster of the same date. On April 16, 1874, I wrote to the defendant Company, calling their attention to the continuance of the nuisance. I received on the 18th an answer to that letter from the defendants, in which they denied the existence of the nuisance at their works "now, or at any former period." On May 26, 1874, Dr. Letheby wrote to the Secretary of the defendant Company, and on the 27th they wrote to the Board, enclosing Dr. Letheby's letter, which stated that there was then no offensive matter. Mr. Keates, in consequence of complaints made, was then called in on July 26, 1874, to inspect the works. I accompanied him. We went about half-past two in the afternoon, and a certain process was going on. We received a report from Mr. Keates, which was communicated to the defendants. For some little time after that there were no complaints made to the Board; but afterwards the Board resolved to prosecute the defendants for not taking the best means to abate the nuisance, inasmuch as they had not followed the scientific advice tendered to them. The summons was taken out, and I cautioned the Secretary and Solicitor of the Company that, if these proceedings did not abate the nuisance, the Company would very likely be indicted. Those proceedings were adjourned from time to time, to enable the carrying out of recommendations that had been made, and on the 11th of November, 1875, Mr. Oakman, having intimated that the nuisance was abated, and the suggestions carried out, the proceedings were stopped. On the same evening there was a complaint from Mr. Oakman. Since then we have received other complaints. On Jan. 6, 1876, matters were almost brought to a crisis. Mr. Oakman then wrote to Dr. Odling complaining of the nuisance, to which a reply was sent to the effect that the apparatus had broken down, but it had been put right. On the 9th of February we received a numerous signed complaint from the inhabitants of the district, headed by the Vicar, and we then resolved to take proceedings. I should say Whiffen's works have been established over 15 years. The Company removed to Lombard Road in January, 1872. We received complaints in May, 1872. The Alum Company removed from Nine Elms to Vauxhall, just within the limits of our districts. When they were in Nine Elms we received very serious complaints from St. George's Square, and other neighbourhoods opposite the works, which were situated on the river. We have not received complaints as to any nuisance from the Nine Elms or St. George's Square district since the removal of the Alum Company's works; they have been made in regard to another nuisance altogether. The smell of Whiffen's works is rather pleasant than otherwise. The smell of the alum works is very pungent, and cannot be mistaken for the smell from Whiffen's works. When I have been on the Alum Company's premises I could not get rid of the smell for hours. I have detected it at a distance of 400 or 500 yards. My house is over a mile from the works, with intervening buildings.

Cross-examined by Mr. MURPHY: The Board have undertaken the prosecution in discharge of a very painful public duty. I advised the Board to undertake it. I believe on one or two occasions, Mr. Wallace, who was convicted this morning, has either moved or seconded resolutions with the view of taking these proceedings. Only four medical men have been consulted, as far as I know, as to the nuisance. I believe that all the recommendations suggested by these gentlemen have been carried out. I have always had access on every occasion to the defendants' works. I do not wish to suggest that there has been any attempt at concealment of the defendants' process from first to last.

Mr. MURPHY: Is it not a fact that the complaints made by the inhabitants of Nine Elms were submitted to the Medical Officer, and he reported that there was no foundation whatever?

Witness: Dr. Connor and his son reported that there was no foundation for the nuisance complained of. As far as I remember, they visited the works when the operations were not going on, so that they cannot know much about them. I do not know that one of the operations carried on at the works up to 1874 has been abandoned. I have heard the reports read. I have passed the gates of the premises sometimes, and have not smelt anything offensive. I do not know whether on these occasions the works were in operation or not. The smell from the mixing of the sawdust with the sulphuric acid resembles aromatic vinegar. I went with Mr. Keates in the summer time to visit the works. I have no recollection of seeing any flowers growing at the Manager's house, close by the works. I am not aware that cuttings are successfully taken from these plants. I have not seen, I admit, a man in the works who had an unhealthy look about him. The Manager's house adjoins the works, and the Engineer has also a house adjoining the works. I cannot say if the signal-box on the railway is close to the works. No doubt the men in the signal-box could speak as to the noxious fumes that proceeded from the chimney, if they ever smelt them. There is a railway station not far from the works, but I have not subpoenaed the station-master. Miss Unwin made a complaint to us. I am not aware that those who succeeded her as tenants have been subpoenaed by the defendants. I have never heard of any complaints from Mr. Beale, who is an agent for property in the neighbourhood. Until the Company came to the neighbourhood we had no complaints as to bad smells. No doubt Mr. Whiffen's works have been complained of once or twice, and we have also had some complaints of the works opposite Mr. Whiffen's. I do not know of my own knowledge that there is any foul, filthy smell now coming out of Whiffen's sewer. The reason I did not communicate with the defendants on the day after the proceedings were stopped was, I suppose, because I had no instructions to do so. There was another complaint made on the 6th of January. I have no doubt that the statement that there was an accident at the works was correct. There has been no other communication with the defendants previous to the bringing of the present indictment.

Re-examined by Mr. MORGAN HOWARD: I am Clerk of the Board, and have only followed their instructions in taking these proceedings. The complaints against Mr. Whiffen's works were only very slight. In the neighbourhood of the works there is a training college and a Wesleyan college, and there are all grades of society living there.

Mr. J. N. Pilditch, examined by Mr. SMITH.

I am Surveyor to the Battersea district of the Wandsworth Board of Works, and have been so for four years. [Witness described the position of the defendants and Whiffen's works]. I have the charge of cleaning the sewer. It is now thoroughly cleansed. There is a coffee smell which sometimes comes from the sewer, and is quite distinguishable from the smell produced by the alum works, which is very oppressive to breathing. My office is about a quarter of a mile from the works. I have heard complaints from the neighbourhood of the nuisance caused by the works, and in other neighbourhoods, in the course of my duties. On two occasions the vapour that came from the works resembled a thick fog. I saw it coming from the ventilators on the roof, and I am certain that it did not arise from the sewer.

Cross-examined by Mr. MURPHY: I cannot fix the date of these two occasions, but I should say it was a year and a half ago. I never knew the works to be so bad as on those two occasions. I did not hear that there had been an accident. I cannot say my health has been affected by the smell.

Re-examined by Mr. MORGAN HOWARD: I have been at the works 14 or 15 times. The sample produced gives no idea of the pungency of the



smell. For the last twelve months there has been nothing to complain of in the way of nuisance from the works.

Mr. MURPHY, in answer to his lordship, said there had been no alteration in the works since the date of the indictment.

Lord COLERIDGE here expressed his opinion that, considering the last answer of the witness, that there had been no nuisance for twelve months, it was almost a waste of time to proceed with the case.

Mr. MORGAN HOWARD said that if the Board were obliged to institute proceedings two years ago for the state of things then, surely they were entitled to ask the judgment of the Jury now.

Lord COLERIDGE: They have a legal claim; but I want to know where the moral claim is. If there has been nothing for twelve months to complain of, I cannot see any use in going on.

The Court then adjourned for luncheon. On re-assembling,

Mr. MORGAN HOWARD said the parties, in the interval, had had the opportunity of considering the parting remark of his lordship, and the position in which the case then stood. He had endeavoured to approach the consideration of the case in a spirit of justice both to the Board and the defendants; but he understood from his learned friend what he was not aware of when addressing the Jury, that there had been a discontinuance of that part of the process which probably had led to so many complaints. He also understood that that part of the process would not be resumed, and, under the circumstances, he felt, on the part of the Board—who,

he hoped, had temperately discharged a public duty, which was forced upon them by the situation—that he was in a position now to suggest that the proceedings should, under the circumstances, cease.

Mr. MURPHY, on behalf of the Company, said he was not sorry that the prosecution had been instituted, because they felt there should be a public investigation of the matter, and the result that had been arrived at was one which they felt must inevitably follow from an investigation of the circumstances. They had endeavoured fairly to follow out all the suggestions that had been made in order to avoid every possible offence, and had not the slightest intention of recommencing the process complained of, and had authorized him to say so publicly. He could not but compliment Mr. Morgan Howard for the impartial way he had stated the facts to the Jury, thereby saving much public time.

Lord COLERIDGE congratulated the parties on the agreement that had been come to, coinciding as it did with the opinion he had already expressed. There was no issue for the Jury to try.

Mr. MORGAN HOWARD: We propose to withdraw a juror.

Mr. MURPHY: I ask for a verdict of "Not guilty."

Lord COLERIDGE: I think there should be a verdict of "Not guilty," although it will not prevent the Board from doing anything if there is a recurrence of the nuisance.

A formal verdict of "Not guilty" was then entered, and thus the matter ended.

## Miscellaneous News.

### LONDON GASLIGHT COMPANY.

The Ordinary Half-Yearly Meeting of Proprietors was held on Wednesday, the 3rd inst., at the Freemasons Tavern, Great Queen Street. The chair was taken by MAJOR RHODE HAWKINS, Esq., the Governor.

The following report was taken as read:—

Annexed to this report are submitted the half-yearly accounts, which show the result of the manufacture and distribution of gas to Dec. 31, 1877.

In accordance with the intimation given to the Shareholders at the last meeting, a reduction was made in the price of the common gas supplied by this Company for the latter quarter of the half year, by which the consumers are benefited to the extent of above £15,000 per annum. The charge for cannel gas had already been reduced in the previous half year.

The low price of the residual products still unfavourably affects the profits—far alone showing a reduction during the half year of £2300; and a further decrease in the price of this residual has since taken place.

Notwithstanding the reductions referred to, the general business of the Company shows results which admit of the payment of the interest and dividends on the preference stocks and shares, and also on the ordinary capital. The Directors accordingly recommend that the usual dividend at the rate of 10 per cent. per annum be declared on the ordinary stock, and that the several dividends be paid on the 15th of April. After payment of these, there will remain £4392 17s. 3d. to be added to the reserve-fund.

Three Directors—namely, Major Rhode Hawkins, Esq., Julian Danvers, Esq., and Miles Miley, Esq., retire by rotation, and, being eligible, offer themselves for re-election.

One Auditor—namely, Jonathan Denny, Esq., also retires by rotation, and, being eligible, offers himself for re-election.

No. 1.—STATEMENT OF STOCK AND SHARE CAPITAL, on Dec. 31, 1877.

Acts of Parliament relating to the Raising of Capital.	Description of Capital.	Maximum Dividend authorized.	Number of Shares issued.	Nominal Amount of Shares.	Called up per Share.	Total paid up.	Arrears of Calls.	Remaining to be called up.	Total Amount authorized.
15 Viet., cap. 82 . . . . .	Ordinary stock . . . . .	10 per cent.	Stock	Stock	Stock	£384,900	..	..	£384,900
	2nd pref. " . . . . .	6 ditto.*	Do.	Do.	Do.	10,000	..	..	10,000
	3rd ditto " . . . . .	6 ditto.*	Do.	Do.	Do.	2,250	..	..	2,250
	1st ditto " . . . . .	6 ditto.	Do.	Do.	Do.	150,000	..	..	150,000
29 Viet., cap. 55. . . . .	A ditto shares . . . . .	6 ditto.	12,000	£25 0 0	£20 and £1 5s.	185,867	£250	£113,983	300,000
20 & 21 Viet., cap. 73 . . . . .	1 & 2 Deb. stks. . . . .	6 & 5 ditto.	Stock	Stock	Stock	26,692	..	..	26,692

\* With option of conversion.

No. 2.—STATEMENT OF LOAN CAPITAL.

Acts of Parliament authorizing the Loan Capital.	Description of Loan.	RATES PER CENT. OF INTEREST.		Total Amount borrowed.	Remaining to be borrowed.	Total Amount authorized.
		4½ per Cent.	5 per Cent.			
15 Viet., cap. 82 . . . . .	Bonds, 4½ per cent. . . . .	£91,862	£12,607	£104,469	£74,385	£91,667
29 Viet., cap. 55 . . . . .	Debenture stock, &c. . . . .					100,000

Dr.

No. 3.—CAPITAL ACCOUNT.

Cr.

		Description of Capital.	Certified Receipts to June 30, 1877.	Received since that date.	Total Receipts to Dec. 31, 1877.
To Expenditure to June 30, 1877. . . . .	£331,535 3 10	By Ordinary stock . . . . .	£384,900 0 0	..	£384,900 0 0
Balance . . . . .	10,642 12 6	2nd Preference ditto. . . . .	10,000 0 0	..	10,000 0 0
		3rd ditto ditto. . . . .	2,250 0 0	..	2,250 0 0
		1st ditto ditto. . . . .	150,000 0 0	..	150,000 0 0
Total expenditure. . . . .	£342,177 16 4	A ditto shares, £25 each, including amount received in anticipation of calls . . . . .	185,515 0 0	352 10 0	185,867 10 0
Balance . . . . .	22,001 6 2	1st & 2nd Debenture stocks, under 20 & 21 Viet., cap. 73 . . . . .	26,692 12 6	..	26,692 12 6
		Bonds, &c. . . . .	76,507 0 0	..	73,907 0 0
		4½ per cent. debenture stock . . . . .	30,562 0 0	..	30,562 0 0
		Note * £2600 paid off. . . . .	£366,426 12 6	..	£366,426 12 6
					£364,179 2 6

No. 4.—REVENUE ACCOUNT, for the Half Year ending Dec. 31, 1877.

To Manufacture of gas—		By Sale of gas—	
Coals, including dues, carriage, unloading, and trimming (see Statement No. 8) . . . . .	£48,642 11 5	Common gas, per meter, at 3s. 6d. and 3s. 3d. per 1000 cubic feet. . . . .	£88,779 8 7
Salaries of Engineers, Superintendents, and other officers at works . . . . .	2,042 6 0	Cannel gas, per meter, at 4s. 4d. per 1000 cubic feet . . . . .	4,979 17 4
Wages (carbonizing) . . . . .	9,741 8 2	Public lighting, and under contracts—	
Purification, including £877 9s. for labour. . . . .	1,081 5 0	Common gas . . . . .	9,885 18 2
Repairs and maintenance of works and plant, materials, and labour, less £265 2s. 1d. received for old materials . . . . .	11,805 13 1	(See Statement No. 10.) . . . . .	£103,645 4 1
The Gaslight and Coke Company, for cannel gas . . . . .	£73,313 3 8	Rental of meters. . . . .	2,063 10 0
Distribution of gas—	4,199 0 1	Residual products—	
Salaries and wages of officers (including rental clerks) . . . . .	£2,180 13 10	Coke, less £1652 3s. 2d. for labour and cartage . . . . .	£19,038 18 6
Repairs, maintenance, and renewals of mains and service-pipes, including labour . . . . .	6,963 5 3	Breeze, less £240 13s. 4d. . . . .	1,033 7 8
Repairs and renewals of meters . . . . .	1,527 11 4	Tar, less £23 19s. 4d. . . . .	5,694 19 1
Public lamps—		Ammoniacal liquor, less £12 . . . . .	4,458 0 0
Lighting and repairing . . . . .	10,671 10 5		30,885 5 3
Rents, rates, and taxes—		Rents receivable . . . . .	1,563 1
Rents payable . . . . .	£942 14 6	Transfer fees . . . . .	8 7
Rates and taxes . . . . .	4,335 3 0		
Management—			
Directors allowance. . . . .	£1,075 0 0		
Company's Auditors . . . . .	75 0 0		
Salaries of Secretary, Accountant, and Clerks . . . . .	1,189 8 2		
Collectors commission . . . . .	1,190 1 6		
Stationery and printing . . . . .	315 8 5		
General charges . . . . .	395 4 11		
	4,240 3 0		
Law charges . . . . .	115 6 6		
Parliamentary charges (oppositions). . . . .	109 8 0		
Bad debts . . . . .	445 13 0		
Depreciation-fund for works on leasehold land . . . . .	100 0 0		
Superannuations, sick allowances, and gratuities . . . . .	436 11 8		
Repairs of houses . . . . .	19 4 11		
Total expenditure . . . . .	£100,404 14 3		
Balance carried to net revenue account, No. 5 . . . . .	37,760 14 1		
	£138,165 8 4		£138,165 8 4



No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on bonds, $\frac{1}{2}$ per cent. debenture stock, &c., to Dec. 31, 1877. . . . .	£2,389 12 7	Balance from last account . . .	£25,804 17 8
Dividends on preference capital . . . . .	11,192 16 3	Less dividend on ordinary capital for the half year ending June 30, 1877 . . .	19,245 0 0
	£13,582 8 10		£6,559 17 8
Redemption-fund, reserve per London Gaslight Act, 1857. . .	750 0 0	Amount from revenue account, No. 4 . . . . .	37,760 14 1
Balance applicable to dividend on ordinary capital . . .	30,197 14 11	Interest on moneys on deposit . .	209 12 0
	£44,530 3 9		£44,530 3 9

No. 6.—RESERVE-FUND.

Balance on Dec. 31, 1877. . . . .	£48,751 17 6	Balance on June 30, 1877. . . . .	£47,996 9 3
		Interest on amount invested. . .	755 8 3
	£48,751 17 6		£48,751 17 6

No. 7.—DEPRECIATION-FUND (FOR WORKS ON LEASEHOLD LAND).

Balance on Dec. 31, 1877. . . . .	£1,800 0 0	Balance on June 30, 1877. . . . .	£1,700 0 0
		Amount brought from revenue account for the half year ending Dec. 31, 1877. . .	100 0 0
	£1,800 0 0		£1,800 0 0

No. 8.—STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1877.	Received during the Half Year.	Carbonized during the Half Year.	Used for Sundries during the Half Year.	In Store, Dec. 31, 1877.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common . . . . .	14,492	53,929	57,916	44	10,461
Cannel . . . . .	842	3,621	3,376	..	1,087

No. 9.—STATEMENT OF RESIDUAL PRODUCTS.

Description of Residual.	In Store, June 30, 1877.	Made during the Half Year (estimated).	Used during the Half Year (estimated).	Sold during the Half Year.	In Store, Dec. 31, 1877.
Coke, chaldrons of 36 bush. . .	2,835	59,686	16,602	42,673	3,246
Breeze, " " " " " " " " .	94	6,392	..	6,059	427
Tar, gallons . . . . .	164,000	598,910	..	574,910	188,000
Am. liqr., butts of 108 gals. .	185	11,426	..	9,352	2,259

No. 10.—STATEMENT OF GAS MADE, SOLD, &amp;c.

Description of Gas.	QUANTITY (measured by Station Meters).		QUANTITY SOLD.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
	Made.	Purchased.	Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common . . . . .	612,042	..	53,652	532,999	586,651	6,849	593,500	18,542	5,114
Cannel . . . . .	..	24,579	..	22,984	22,984	1	22,985	1,594	..

BALANCE-SHEET.

To Capital—	By Cash at bankers, and in hand . . . . .	£12,879 8 8
For balance, per account No. 3 . . . . .	Amount invested—	
Net revenue—	Reserve-fund . . . . .	£47,996 9 3
For balance, per account No. 5 . . . . .	Redemption-fund. . . . .	4,118 10 6
Reserve-fund—	Unclaimed dividends . . . . .	4,028 11 11
For balance, per account No. 6 . . . . .		56,143 11 9
Depreciation-fund (for works on leasehold land)—	Stores on hand, viz.—	
For balance, per account No. 7 . . . . .	Coals . . . . .	£10,055 9 0
Redemption-fund . . . . .	Coke and breeze. . . . .	1,370 10 10
Bond, $\frac{1}{2}$ per cent. debenture stock, &c., interest for amount due to Dec. 31, 1877 . . . . .	Tar and ammoniacal liquor . . . . .	1,762 10 0
Preference dividends, ditto. . . . .	Sundry stores . . . . .	3,012 7 3
Unclaimed dividends . . . . .		16,200 17 1
Sundry tradesmen and others, for amount due for coals, stores, and sundries. . . . .	Accounts due to the Company—	
	Gas and meter rental, quarter ending Dec. 31, 1877 . . . . .	£58,963 2 7
	Ditto arrears outstanding . . . . .	3,567 10 8
		£62,530 13 3
	For coke and other residual products . . . . .	13,892 10 4
	Sundries . . . . .	2,076 8 9
		78,499 7 4
		£163,723 4 9

The GOVERNOR, in moving the adoption of the report and statement of accounts, said: I really have very little to say to you on the subject of the accounts. You see for yourselves that we are doing a very satisfactory business. While we have given the public the benefit of a reduced price, we have still been able, not only to pay our dividends, but to carry a very respectable sum to the reserve-fund; so that really, as far as the business is concerned, I do not think we could wish to be in a more prosperous condition. I may say a few words with regard to the electric light, which seems rather to exercise people's minds at the present time. I do not think we need be very anxious about it. It certainly is not, as yet, in a state to compete with gas in any important way. Of course, one could not venture to say that the progress of science, as applied to electricity, is at an end; but, at present, it is not in a position to seriously compete with us, and may not be for a very long time. Besides this, if science attacks us in that direction, we know that it is helping us in another. If you look at the accounts you will see that the products are producing very much better results than they used to do. Take the tar and the ammoniacal liquor for instance. Some years ago they were a perfect drug and a nuisance, and produced no profit; now they are producing something like £20,000 a year; so that we may fairly imagine that if science interferes with the result of distilling coal, it will, on the other hand, find a remedy, and compensate us in some other way. There is another matter which I should wish to draw the attention of the public to—namely, the use of gas for other purposes besides lighting. At its present low price, I am perfectly confident that, under judicious management, the use of gas might be enormously extended, both for cooking and warming purposes. There would be an immense advantage as regards cleanliness and economy, and usefulness in every way. I am very glad to see that the people of Birmingham are alive to the question, and intend shortly to have an exhibition of various apparatus for cooking and warming by gas. I hope those gentlemen who are interested in that subject will take an opportunity of going down to see what results may be produced. Most of your Directors undoubtedly will.

LORD KINNAIRD (the Deputy-Governor) seconded the motion.

A PROPRIETOR asked if the electric light could not in some way be utilized by Gas Companies so as to turn what otherwise might be an enemy into a profitable friend. He had seen it in use in Paris, and it put the gaslights entirely in the shade, making them look worse than they really were.

The GOVERNOR said it was a very brilliant light for lighting one particular place, but science had not yet discovered any satisfactory way of diffusing it for general use. He could not answer off-hand.

MR. WYATT said the Company were incorporated for a particular purpose, and could not apply their corporate funds to any other. It would be necessary to obtain the sanction of Parliament before any different use could be made of them.

MR. HOBSON said last year the Phoenix Company converted their bonds into ordinary shares, bearing interest at 10 per cent. He wished the Directors of the London Gaslight Company to consider whether it would not be possible to deal with their bonds, which amounted to £76,507, in the same way. Of course the debenture stocks that were fixed could not be paid off; but, in the present palmy days of gas undertakings, he thought the Company might at least convert the bonds into ordinary share capital. The Sheffield Company were just about to pay off all their debenture debt, when they would have no capital at all, except the 10 per cent. all round, without any debts hanging over their heads. The amount

of preference stock was so great that it was out of the question to think of converting that. The plan he suggested had answered perfectly well in some other companies, and, if done at all, it should be done before the Company again applied to Parliament, for the Board of Trade or other Government officials were constantly bringing forward limitation on Gas Companies. Large collieries were now ready to take contracts for the ensuing twelve months, at a lower price than was demanded for the past year, and when the reserve-fund was raised to a safe sum, he thought the transfer of bonds into open stock would be a subject worthy of the consideration of the Directors.

MR. OXENHAM said it would injure the ordinary Shareholders. If the ordinary stock was increased in the manner proposed, the shares would go down.

MR. HOBSON said the benefit he had derived from the change in the Phoenix was more than £1000. It had added £150,000 to the profits of that Company.

The GOVERNOR said at the present time there was about £400,000 of this Company's capital carrying a dividend of 10 per cent. Sooner or later the Company must go to Parliament for increased powers to raise more capital. They would then be put under the same regulations as The Gaslight and Coke Company, and have to sell their shares by auction. The transfer of bonds, &c., to 10 per cent. ordinary stock would increase the amount on which 10 per cent. had to be paid by £150,000, while the reserve-fund was limited to 10 per cent. on the total capital. If the present price of coals could be guaranteed for an indefinite period, well and good; but if a great advance took place, and coals rose to 40s. a ton, he confessed he would rather face the Shareholders with £400,000 stock to find dividend for than with £550,000. The object of the Directors was to make the concern as safe as possible, and 10 per cent. on a small sum was much safer than 10 per cent. on a much larger sum. He did not wish to run the chance of getting only 7 or 8 per cent. on the larger sum. He would rather wait some time before taking such a decided step as was now proposed.

MR. KAY asked if there was any prospect of another call upon the 6 per cent. preference shares, which were issued about 18 months ago.

The GOVERNOR said he did not think there was any likelihood of such a call at present; but he hoped the business would increase and cause them to want more money before long. In answer to a further question, he stated that the reserve-fund was absolutely invested in Government securities.

The resolution for the adoption of the report was carried unanimously, as was also another for the declaration of dividends.

The retiring Directors, Messrs. Hawkins, Danvers, and Miley, were re-elected, and Mr. J. Denny was reappointed Auditor.

MR. RAWLINSON proposed a vote of thanks to the Secretary, the Engineer, and the officers of the Company generally, for their attention to the business.

The GOVERNOR seconded the motion, which was agreed to.

MR. DOVE (Secretary) and MR. MORTON (Engineer) replied.

MR. RAWLINSON said he wished to make a few remarks with regard to the electric light. The A B C of mechanical science was that no power could be got out of nature without giving an equivalent in some form or other. In producing electricity, certain metals must be expended; to be effective, very large power must be employed. The electricity must then be transmitted, and regulated at the termination of the transmission. If there were difficulties and complications in transmitting a fluid like gas, he was convinced, from conversations he had had with the most eminent chemists



and mechanics of the day, that there would be much greater difficulty in transmitting and regulating the use of electric light. He, therefore, did not think the electric light would come into competition with gas during the lifetime of any one present. It might be used for large single spaces, but not for ordinary domestic purposes. At the same time, it behoved the Directors to look very carefully at what was being done, and take every precaution to render their property secure.

A PROPRIETOR asked if the Board had considered the automatic system of lighting street-lamps. He had been told that it would effect a saving of £1 a year per lamp.  
The GOVERNOR said Mr. Morton had received instructions to watch that matter very carefully, and, if practicable, the system would be adopted, but it would not do to risk leaving London in darkness, even for a day.  
The usual compliment to the Directors terminated the proceedings.

COMMERCIAL GAS COMPANY.

The Ordinary Meeting of the above Company was held at the Cannon Street Hotel, on Friday, the 5th inst.—RICHARD BRADSHAW, Esq., in the chair.

The following is a copy of the report and accounts presented to the Shareholders:—

The Directors beg to submit the accounts for the half year ending Dec. 31, 1877.  
The revenue account shows a net profit for the half year of £40,717 10s. 2d. Deducting from this £465 14s. 5d. for interest on bonds and debenture stocks to Dec. 31, 1877, and £3100, being at the rate of 1 per cent. per annum on the capital stock of the Company, to be, in accordance with the Company's Act of 1875, carried to an "insurance-fund," there remains the sum of £37,151 15s. 9d., of which, having regard to the sliding scale, and the price of gas charged during the half year, the sum of £33,050 is available for dividend.

No. 1.—STATEMENT OF CAPITAL (Stock) on Dec. 31, 1877.

Acts of Parliament relating to the Raising of Capital.	Dividend Authorized with Gas at an Initial Price of 3s. 9d.	Paid up.	Remaining to be Paid up and Unissued.	Total Amount Authorized.
Commercial Gas Act, 15 & 16 Vict., cap. 155	10 per cent.	£450,000	..	£450,000
Ratcliff Gas Act, 4 Geo. IV., cap. 98	Ditto.	100,000	..	100,000
Commercial Gas Act, 38 & 39 Vict., cap. 200	7 per cent.	70,000	£210,000	280,000
		£620,000	£210,000	£830,000

The Directors recommend the appropriation of this amount as follows:—First, to the payment of a penalty of \$400, which was imposed during the half year, in consequence of a slight excess of ammonia arising from an unavoidable cause; secondly, to the payment of income-tax, amounting to £393 15s.; and, thirdly, to the payment of dividends, after the rates of £10 10s. per cent. per annum upon the old stock, and of £7 10s. per cent. per annum upon the new stock, in both cases free of income-tax, which will absorb £31,500, and leave £756 5s. to be carried to the reserve-fund.

The balance of the net profits, £4101 15s. 9d., added to £5898 17s. 8d., the amount brought forward from previous accounts—together, £11,000 13s. 5d.—will be carried forward to the next half year.

A resolution will be submitted to the meeting to increase the remuneration of the Secretary from £600 to £670 per annum.

Mr. Edward Marsh, one of the Auditors, will go out of office, and, being eligible, offers himself for re-election.

No. 2.—STATEMENT OF LOAN CAPITAL on Dec. 31, 1877.

Acts of Parliament Authorizing the Loan Capital.	Description of Loan.	Rate per Cent. of Interest.	Total Amount Borrowed.	Remaining to be Borrowed.	Total Amts. Authorized.
Ratcliff Gas Act, 4 Geo. IV., cap. 98	Bonds.	5 per cent.	£15,670	£4,330	£20,000
Commercial Gas Act, 38 & 39 Vict., cap. 200	Deben. stk.	4½ per cent.	54,547	225,453	280,000
			£70,217	£229,783	£300,000
* At interest not exceeding 5 per cent.					
Total share capital paid up (see No. 1)			£620,000		
Total loan capital borrowed (see No. 2)			70,217		
			£690,217		

No. 3.—CAPITAL ACCOUNT.

Dr.	Total to June 30, 1877.	Cr.	Certified Receipts to June 30, 1877.	Received this Half Year.	Total to Dec. 31, 1877.
To Expenditure to June 30, 1877	£588,281 12 0	By Stock	£550,000 0 0	..	£550,000 0 0
Ditto this half year on additional plant	22,578 8 0	New stock	70,000 6 0	..	70,000 6 0
Total expenditure	£610,860 0 0	Bonds	15,670 0 0	£54,547 0 0	54,547 0 0
Balance	79,357 0 0	Debenture stock			
	£690,217 0 0		£635,670 0 0	£54,547 0 0	£690,217 0 0

No. 4.—REVENUE ACCOUNT, for the Half Year ended Dec. 31, 1877.

To Manufacture of gas— Coals, including dues, carriage, unloading, and trimming (see Account No. 7)	£55,178 4 10	By Sale of gas— Common gas, per meter, at 3s. 5d. per 1000 cubic feet	£97,047 7 5
Salaries of Engineers, Superintendents, and other officers at works	1,436 10 0	Public lighting and under contracts, common gas (See Statement No. 9.)	10,174 6 10
Wages (carbonizing)	11,633 8 0		£107,221 14 3
Purification, including £880 8s. 4d. for labour	3,646 7 1	Meter-rental	2,048 4 4
Repairs and maintenance of plant and works, materials, and labour, less £14 15s. received for old materials	8,635 8 7	Residual products— Coke, less £1206 15s. 2d. for labour	£17,944 5 0
	£80,529 18 6	Breeze, less £142 15s. 3d. for labour	198 13 8
Distribution of gas— Salaries and wages of officers (including rental clerks)	£1,766 19 4	Tar	5,116 9 10
Repairs, maintenance, and renewals of mains and service-pipes, including labour	3,319 10 2	Ammoniacal liquor, less £12 19s. for labour	4,810 16 3
Repairs and renewals of meters	1,401 18 11		28,070 4 9
	6,483 8 5	Miscellaneous receipts, viz.— Rents	£135 17 2
Public Lamps— Lighting and repairing	1,787 5 11	Interest	81 4 11
Rents, rates, and taxes	2,870 6 8	Transfer fees	33 10 0
			250 12 1
Management— Directors allowance	£1,600 0 0		
Company's Auditors	125 0 0		
Salaries of Secretary, Accountant, and Clerks	691 12 6		
Collectors commission	775 14 0		
Stationery and printing	420 1 6		
General charges	310 5 2		
	3,922 13 2		
Bad debts	513 5 11		
Law charges	439 14 0		
Supernuations	233 6 8		
Official officers	88 6 0		
Total expenditure	£96,873 5 3		
Balance carried to net revenue account (No. 5)	40,717 10 2		
	£137,590 15 5		£137,590 15 5

No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on bonds to Dec. 31, 1877	£391 15 0	Balance, June 30, 1877	£36,556 3 8
Interest on debenture stock to Dec. 31, 1877	73 19 5	Less dividend to June 30, 1877	29,657 6 0
Balance available for dividend carried to balance-sheet	47,150 13 5	Balance from revenue account	£6,898 17 8
	£47,616 7 10		40,717 10 2
			£47,616 7 10

No. 6.—RESERVE-FUND.

Balance on Dec. 31, 1877	£26,912 6 6	Balance on June 30, 1877	£26,505 5 11
		Dividends received	407 0 7
	£26,912 6 6		£26,912 6 6

No. 7.—STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1877.	Received during the Half Year.	Carbonized during the Half Year.	In Store, Dec. 31, 1877.
	Tons.	Tons.	Tons.	Tons.
Common	4,780	67,918½	59,195½	13,533
Cannel	810	6,021¾	5,489¾	1,373
	5,620	73,970	64,684	14,906

No. 8.—STATEMENT OF RESIDUAL PRODUCTS.

	In Store, June 30, 1877.	Made during the Half Year.	Used during the Half Year.	Sold during the Half Year.	In Store, Dec. 31, 1877.
Coke	710	62,041	19,157	40,794	2,800
Breeze	255	5,700	..	5,255	700
Tar	48,450	579,678	..	505,387	122,750
Ammoniacal liquor—Butts of 108 gallons	481	16,801	..	16,652	630







Mr. GOULD asked when it was likely that the £15,000 would be mortgaged, and part of it paid off.

The CHAIRMAN: In August.

The resolution was then put and carried.

The CHAIRMAN then moved—"That, pursuant to the recommendation of the Board of Directors, the sum of £33,050, available for dividend for the half year ended Dec. 31, 1877, on the ordinary and new stocks, comprising the capital of the Company, be apportioned as follows:—First, in payment of a penalty of £400 imposed upon the Company for an excess of ammonia in September last; secondly, in payment of income-tax, amounting to £393 15s.; and, thirdly, in payment to the Proprietors of dividends after the rates of £10 10s. per centum per annum upon the old stock, and of £7 10s. per centum per annum upon the new stock, in both cases free from income-tax, and that the balance, £756 5s., be carried to the reserve-fund."

Mr. SAMUDA seconded the motion, which was carried.

The CHAIRMAN intimated that the dividend warrants would be posted that afternoon, and he hoped the Proprietors would receive them in the evening.

On the motion of Mr. LIDDLE, seconded by Mr. GOULD, Mr. Edward Marsh was unanimously re-elected Auditor.

Mr. MARSH thanked the Proprietors for the expression of their confidence. The accounts were put so clear before them that they were very much assisted in their duties.

The CHAIRMAN then moved that the salary of the Secretary be increased from £600 to £700 a year. The Directors, he said, had much pleasure in recommending that. They had now had some experience of Mr. Southwell, and could assure the Shareholders that they were very efficiently served by him.

Mr. SAMUDA seconded the motion.

Mr. LIDDLE regretted that the salary was not made a little larger. He thought that in such a large Company the amount paid to the Secretary was smaller than it ought to be. The late Secretary had been paid very large amounts.

The CHAIRMAN: Only £800 a year, after 30 years service.

Mr. GOULD thought that the Directors were proposing this rise in the Secretary's salary too early, and that they should allow two years to elapse before they made the advance. There was not the labour now that there was in the previous days of the existence of the Company, when they had had a struggle.

Mr. MOODY said he had known the Secretary for a great number of years, and he thought the Company had never had a more careful or more efficient officer. It was the regret of everybody who knew him when he left the situation he had held so well and so long to accept his present post, and he (Mr. Moody) would be only too glad to support the proposal of the Directors.

Mr. SAMUDA said he was quite sure that those present would all come to one conclusion, and he hoped that whatever was done would be done unanimously. He bore testimony to the efficiency with which the Secretary performed his duties, and was sure Mr. Southwell would value the recommendation all the more because it came from the Directors.

Mr. GOULD said he did not intend by his remarks to impute any disrespect to Mr. Southwell. He felt great pleasure in the selection the Company had made; but he was only referring to the merits of the case, because he knew more than the more recent Shareholders as to the earlier position of the Company.

The CHAIRMAN remarked that the work of the Secretary had somewhat increased since Mr. Jacobs's time. The Proprietors now numbered 1002; formerly they were only 500 or 600; and, in addition to that there were 400 debenture holders, so that the work had been increased.

The resolution was then put and unanimously carried.

The SECRETARY returned his sincere thanks for the mark of approval that had been bestowed upon his conduct, and assured the Shareholders that his best energies would at all times be exercised on behalf of the Company. He appreciated very highly the recommendation that had been made, coming as it did from such a direction.

Mr. MITTER proposed a vote of thanks to the Chairman and Directors, who, he said, had a very great deal to look after, especially in this age, when every sort of appliance was brought forward to try and supersede gas.

The vote was carried by acclamation.

The CHAIRMAN briefly returned thanks.

Mr. LIDDLE then moved a vote of thanks to the Engineers, upon whom, he said, the success of the undertaking very much depended. Had it not been for the valuable advice tendered by these gentlemen, the Company would not have been in such a prosperous position as they now found themselves.

The CHAIRMAN seconded the motion, and in doing so remarked that no one knew better than the Board of Directors how well it was deserved. He was sure that there was no Company in the Metropolis so well served by their Engineers as the Commercial Gas Company, and he quite agreed with Mr. Liddle that the prosperity of the Company had been in a great measure due to the energy of their Engineers.

The resolution was carried unanimously.

Mr. JONES having in a few words returned thanks, the proceedings terminated.

**EMBEZZLEMENT BY THE SECRETARY OF THE DORKING WATER COMPANY.**—On the 30th ult., Edward Gumbrell, late Secretary of the Dorking Water Company, was charged before the local Magistrates with embezzling the sum of £275, moneys received by him on account of his employers. Prisoner pleaded "Guilty," and the Company recommending him to the consideration of the Bench, on account of his age and previous good character, the Magistrates decided, instead of sending him for trial, to deal with the offence under the Criminal Justice Act, and sentenced him to be imprisoned for six months.

**UTILIZATION OF GAS LIME.**—A writer in the *Chemical News* says: "The following experiment was made some months since to find if the sulphocyanates, usually found in some quantity in gas lime, could be readily transformed into ferro-cyanides. It is an established reaction that potassium sulpho-cyanate and iron filings heated together yield potassium ferro-cyanide and the sulphides of potassium and iron. I wished to determine if a crude sulpho-cyanate extracted from gas lime would give a ferro-cyanide with the same treatment. Some gas lime was mixed with about 5 per cent. of soda ash, extracted with water, and the solution evaporated to dryness. The dry extract was mixed with iron filings in a mortar, then heated in a small covered clay crucible for a short time over a Bunsen lamp. The residue, boiled with water, and acidified with hydrochloric acid, gave an abundant precipitate of Prussian blue with ferric chloride. I have not time, and it is rather out of my way, to experiment further on this subject at present. If the above process for obtaining ferro-cyanides from gas lime should prove of any commercial value, it would be a ready method of getting rid of at least part of the sulphur compounds in gas lime. Alkaline sulpho-cyanates are very soluble in water, and a strong solution would be obtained by passing the same liquor through successive fresh portions of gas lime until saturated."

#### SHEPPY GAS COMPANY.

The Annual Ordinary General Meeting of Shareholders was held on Wednesday, the 27th ult.—Mr. J. COLE in the chair.

The SECRETARY (Mr. A. W. Marks) read the following report of the Directors:—

The works and plant of the Company are in thorough working order, and all necessary repairs and renewals have been duly made. Some additional mains have been required to supply new buildings, and it has been found advisable to provide a duplicate steam-engine in the exhaust-house.

The gas-rental shows a very encouraging increase during the year. Since the Special Act of the Company was obtained, the rental has risen from £5275 in 1870, to £6804 in the past year, being an increase in seven years of £1529, or 29 per cent. The rates obtained for residuals have slightly decreased.

A contract has been made for the year's supply of coals at a further reduction. Considerable doubt exists as to the liability for Rochester port dues on coals landed at the wharf of the Company, but the Directors have not yet been able to deal effectually with the question.

In response to an application from the Directors, the holder of the mortgage of £3000 has consented to reduce his rate of interest from 5 to 4½ per cent. per annum.

A charge of £199 13s. 6d. has been made on the Company for private improvement expenses, in respect of making up the road and footways at West Minster; which sum has been paid since the accompanying accounts were closed. As fully one-half of this charge is assessed on the frontages of the works, and of land reserved for future extensions, it is proposed to treat £100 of this amount as a capital charge, and to gradually write off the remainder by increasing the yearly charge for roads, &c., to £25.

The surplus profit for the year, after providing for the usual dividends, will augment the reserve-fund account to £1858 18s. 10d. As an incentive to the still more general use of gas, and in order that consumers may fairly participate in the prosperity of the Company's business, it has been deemed advisable by the Directors to announce a virtual reduction of 3d. per 1000 feet to private consumers for gas supplied from and after July next. This reduction will be given as a discount on all accounts at 4s. 6d. per 1000 feet, paid promptly—a system which worked very advantageously some years since.

Dividends at the usual rates were paid on Nov. 1, 1877, in respect of the first half of the year. The Directors now recommend the declaration of dividends at similar rates for the second half of the year, payable by warrant on May 1 next. These will make up dividends for the year at the rates of 4 per cent. on the A shares, and 10 per cent. on the B and B\* shares.

The Directors who, this year, retire by rotation are Messrs. J. Cole, A. Filmer, and G. Filmer, who, being eligible, with the Auditor, Mr. E. W. Brightman, offer themselves for re-election accordingly.

Dr.	Trade Account for the Year 1877.				Cr.
Coals carbonized	£3571	16	2	Gas-rental	£6613 14 6
Purifying	32	11	6	Meters, fittings, and stove hire	191 1 3
Wages on manufacture and distribution	820	16	10	Coke, tar, and liquor produced, £1634 11 1	
Directors' fees	60	0	0	Less cartage paid 76 7 4	
Auditor's salary	15	0	0		1558 3 9
Secretary's commission	265	0	3	Coals sold at works.	109 18 9
Manager's salary	240	0	0	Water sold at works	4 1 9
Rent, rates, taxes, &c.	261	18	3	Gas-fittings	186 10 10
Stationery, stamps, and incidentals	44	0	1	Transfer fees	4 15 0
Repairs, renewals, tools, and stores	229	11	2	Rent charges	11 15 0
Retort account	156	0	0	Rent of garden plots	17 15 8
Bad debts	50	0	0	Miscellaneous	5 0 0
Deterioration account	190	0	0		
Coals for sale	87	3	0		
Gas-fittings and labour thereon	158	14	1		
Repair of roads and river wall	10	0	0		
Interest	149	16	0		
Profit on first half year	1013	7	8		
Profit on second half year.	1360	6	6		
	£8700	1	6		£8700 1 6

Mr. TODHUNTER moved, and Mr. HARE seconded, the adoption of the report and accounts.

Mr. JACOBS asked several questions respecting the accounts, which he professed not to understand and referring to the item of Directors remuneration, inquired whether ladies who were Shareholders were entitled to a seat on the directorate, the same as at the School Board.

The CHAIRMAN said he was quite aware that ladies could occupy seats on the School Board, but he did not think such a contingency was provided for by the Act under which the Company were incorporated; besides, this would not be a means of reducing the fees, for surely Mr. Jacobs did not expect that ladies, any more than gentlemen, would devote their time to the business of the Company without receiving some remuneration.

Mr. JACOBS expressed an opinion that the item of "Bad debts" was too large, especially considering that the Directors required deposits from doubtful customers.

The CHAIRMAN said that every consumer was not called upon for a deposit, and strange as it might appear, it was nevertheless true that the bad debts were contracted by those who were not looked upon as doubtful customers, and who had, therefore, not paid a deposit. The Directors were anxious to keep this item down to the lowest possible ebb, but at times they were deceived by the apparent respectability of their customer, who, in the end, turned out to be a man of straw. A considerable portion of the amount charged in the present accounts was lost by one of their customers going into bankruptcy.

The SECRETARY said the bad debts amounted to 13s. per cent. on the rental.

The motion having been put and carried, the dividends recommended in the report were declared.

The CHAIRMAN said they must all be pleased to know that the undertaking was still in a flourishing condition. The report, about which scarcely anything had been said, showed that the Directors had entered into a contract by which the coals would be obtained at a cheaper rate, and also that they had succeeded in getting the interest upon the mortgage reduced, which of itself must convince them that the Directors had not been altogether idle during the past year. The Company had gone on steadily progressing year after year, and they were now enabled to recommend the dividends contained in the resolution, and likewise carry forward a sum to the reserve-fund.

The retiring Directors having been re-elected,

The CHAIRMAN returned thanks for the confidence again placed in him, and said it was nearly twenty years since he was first elected to a seat on the directorate of the Company, and he had occupied the position of Chairman for a period of seven years. It had been his endeavour to devote his attention to the interest of the Company in the past, and he trusted their labours would be crowned with equal success in the future. He was glad to see the Messrs. Filmer again elected, as he should have been exceedingly sorry had he been deprived of their services.

The retiring Auditor was re-elected, and on the motion of Mr. TODHUNTER, seconded by Mr. JACOBS, a vote of thanks was given to the Directors and Officers of the Company for their services during the year, which having been carried and duly acknowledged, the proceedings terminated.

**FIRE AT THE CLIPPENS OIL-WORKS.**—On Tuesday afternoon last a disastrous fire occurred at the works of the Clippens Oil Company, Limited, situated in the village of Linwood, about three miles north-west of Paisley. The origin of the fire is not known. The damage is estimated at from £8000 to £10,000.



PHŒNIX GASLIGHT AND COKE COMPANY.

The Adjourned Half-Yearly Meeting of Shareholders was held at the Bridge House Hotel, on Wednesday, the 3rd inst.—JAMES SHAND, Esq., M.I.C.E. (Deputy-Chairman), in the absence of the Chairman through ill-health, presiding.

The minutes of the meetings held on Oct. 3, 1877, and Jan. 2, 1878, were read and confirmed.

The following are the report and accounts submitted to the shareholders:—

The Directors submit herewith trade account and balance-sheet to the 31st of December last.

The tank for the large gasholder at Kennington is completed, and the construction of the ironwork is progressing.

The tank for the additional gasholder at Greenwich is approaching completion, and a contract has been entered into for the ironwork.

Additional mains of large size have been laid in various parts of the district for the

better distribution of the gas, and your Directors have under consideration still further extensions in this important branch of the Company's operations. It will, therefore, be necessary to make a call of 10 per cent. upon the new stock, payable on July 1 next, due notice of which will be given.

A considerable amount of work in restitution and improvement has been executed during the half year, in order to maintain the stations and works in an efficient condition.

The reduction of the price to 3s. 4d. per 1000 cubic feet was effected as from the 1st of October; this operated upon the heaviest quarter, but a satisfactory increase of consumption has taken place.

The balance of net revenue account for the half year is £17,184 18s. 11d.

Your Directors recommend that dividends be declared as follows, viz.:—

On the £20 shares paid in full—10 per cent. per annum	£27,000
On the £20 new shares (on £6 of the £16 paid)	3,000
On the capitalized stock paid in full at 5 per cent. per annum	3,600
On the new stock 70 per cent. paid, at 7½ per cent. per annum	8,550

Less income-tax, leaving a balance of £5034 18s. 11d. £12,150

No. 1.—STATEMENT OF STOCK AND SHARE CAPITAL, on Dec. 31, 1877.									
Acts of Parliament relating to the Raising of Capital.	Description of Capital.	Maximum Dividend Authorized.	Number of Shares Issued.	Nominal Amount of Shares.	Called up per Share.	Total paid up.	Arrears of Calls.	Remaining to be Called up.	Total Amount Authorized.
5 Geo. IV., cap. 78.	Shares	10 per cent.	27,000	£20	All.	£540,000	..	..	£540,000
27 & 28 Vict., cap. 159	Stock.	5 ditto.	..	..	All.	144,000	..	..	144,000
Ditto ditto	Ditto.	7½ ditto.	..	..	70 per cent.	252,000	..	£108,000	360,000
Ditto ditto	Shares.	10 ditto.	10,000	20	£16	155,000	£5000	10,000	200,000
						£1,091,000			£1,244,000

No. 2.—STATEMENT OF LOAN CAPITAL.			
Act of Parliament authorizing the Loan Capital.	Description of Loan.	Rate per Cent. of Interest.	Total Amount Borrowed.
27 & 28 Vict., cap. 159	Bonds.	5 per cent.	£30,000

No. 3.—CAPITAL ACCOUNT.				
Dr.				Cr.
To Expenditure to June 30, 1877.	£1,040,645	11	3	
Ditto during half year to Dec. 31, 1877, viz.—				
New buildings and machinery in extension of works	£17,855	19	0	
New and additional mains and services	13,247	5	2	
Ditto meters	1,027	19	2	
	32,131	3	11	
Total expenditure	£1,072,776	15	2	
Balance	48,223	4	10	
	£1,121,000	0	0	

Description of Capital.	Certified Receipts to June 30, 1877.	Received or Paid off since that Date.	Total Receipts to Dec. 31, 1877.
By Shares of £20 each	£540,000	0 0	£540,000 0 0
Capitalized stock	144,000	0 0	144,000 0 0
New stock	216,000	0 0	252,000 0 0
Bonds	135,000	0 0	30,000 0 0
New shares, £20 each	59,378	0 0	155,000 0 0
	£1,094,378	0 0	£1,121,000 0 0

No. 4.—REVENUE ACCOUNT, for the Half Year ended Dec. 31, 1877.				
To Manufacture of gas—				
Coals, including dues, carriage, unloading, and trimming (see Account No. 7)	£63,603	19	3	
Salaries of Engineers, Superintendents, and other officers at works	1,404	13	5	
Wages (carbonizing)	12,461	1	8	
Sundries used in carbonizing	342	3	4	
Purification, including £759 4s. 3d. for labour	1,483	1	11	
Repairs and maintenance of works and plant, materials and labour, less £708 18s. 10d. received for old materials	27,378	10	3	
Distribution of gas—				
Salaries and wages of officers (including rental clerks)	£1,865	0	0	
Repairs, maintenance, and renewals of mains and service-pipes, including labour	7,509	0	4	
Repairs and renewals of meters	2,270	18	5	
Public lamps—				
Lighting and repairing				11,644 18 9
Rents, rates, and taxes—				
Rents payable	£525	15	0	
Rates and taxes	4,365	7	1	
Management—				
Directors allowance	£1,250	0	0	
Company's Auditors	50	0	0	
Salaries of Secretary, Accountant, and Clerks	1,202	6	9	
Collectors commissions	2,214	6	7	
Sundry expenses relating to collection	16	15	2	
Stationery and printing	696	12	5	
General charges	455	11	11	
				5,885 12 10
Gas Examiner				52 10 0
Law and parliamentary charges				257 1 0
Bad debts				573 7 8
Superannuation allowances				605 13 9
Insurance				291 7 6
Total expenditure	£133,261	6	4	
Balance, carried to net revenue account (No. 5)	46,265	8	3	
	£179,526	14	7	£179,526 14 7

No. 5.—PROFIT AND LOSS (NET REVENUE) ACCOUNT.			
Interest on bonds to Dec. 31, 1877.	£3,273	2	9
Interest on loans and consumers deposits	254	3	11
Dividend for half year to June 30, 1877.	40,366	13	4
Balance applicable to dividends	47,184	18	11
	£91,078	18	11

Balance from last account	£41,741	18	5
Amount from revenue account, No. 4	46,265	8	3
Interest on moneys on deposit	71	12	3
	£91,078	18	11

No. 7.—STATEMENT OF COALS.				
Description of Coal.	In Store on June 30, 1877.	Received during the Half Year ending Dec. 31, 1877.	Carbonized and Used during Half Year ending Dec. 31, 1877.	In Store on Dec. 31, 1877.
	Tons.	Tons.	Tons.	Tons.
Newcastle	8,500	91,276	82,077	17,699
Cannel	216	2,223	1,991	448
	8,716	93,499	84,068	18,147

No. 6.—RESERVE-FUND.			
Balance on Dec. 31, 1877	£103,501	3	3
Balance on June 30, 1877	£101,400	6	7
Interest on amount invested	2,100	16	8
	£103,501	3	3

No. 8.—STATEMENT OF RESIDUAL PRODUCTS.					
	In Store on June 30, 1877.	Made during the Half Year ended Dec. 31, 1877 (estimated).	Used during the Half Year ended Dec. 31, 1877 (estimated).	Sold during the Half Year ended Dec. 31, 1877.	In Store on Dec. 31, 1877.
Coke, chaldrons of 36 bush.	220	84,068	21,065	59,253	3,970
Breeze, ditto ditto	16	5,199	..	4,816	399
Tar, gallons	75,033	810,779	..	796,053	89,759
Am. liq., butts of 198 gals	952	22,133	..	21,005	2,080

No. 9.—STATEMENT OF GAS MADE, SOLD, &c., IN CUBIC FEET.							
Description of Gas.	Quantity Made.	QUANTITY SOLD.			Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity sold.			
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	849,229	62,213	723,848	786,061	795,115	53,814	5,925



## No. 10.—BALANCE-SHEET.

To Capital—		By Cash at bankers . . . . .	£7,321 3 11
For balance, per Account No. 3 . . . . .	£48,223 4 10	Amount invested—	
Net revenue—		Reserve-fund . . . . .	103,501 3 3
For balance, per Account No. 5 . . . . .	47,184 18 11	Stores on hand, viz.—	
Reserve-fund—		Coals . . . . .	£13,681 3 3
For balance, per Account No. 6 . . . . .	103,501 3 3	Coke and breeze . . . . .	1,826 8 0
Unclaimed dividends . . . . .	119 4 3	Tar and ammoniacal liquor . . . . .	1,550 6 3
Sundry tradesmen and others for amounts due for coals, stores, and sundries . . . . .	34,879 10 3	Sundry stores . . . . .	3,380 12 6
Temporary loan . . . . .	14,000 0 0	Accounts due to the Company—	
		Gas and meter rental, for quarter ended Dec. 31, 1877 . . . . .	£88,588 17 10
		Gas and meter rental—arrears outstanding . . . . .	816 2 8
			88,905 0 6
		Coke and other residual products . . . . .	24,799 18 10
		Sundries . . . . .	2,942 5 0
	£247,908 1 6		£247,908 1 6

The CHAIRMAN: I beg to move the adoption of the report. The second paragraph says: "The tank for the gasholder at Kennington is completed, and the construction of the ironwork is progressing." Of course, we are obliged, as we increase our make of gas, to increase our storing capacity, and the Chairman at a previous meeting referred to this. We had a smaller tank, but in the course of time the iron wore away, and had to be renewed; but we found, by a re-arrangement of the ground, a much larger tank could be substituted, and we decided to do so. This will be the largest gasholder in London, as it will be capable of containing 3 million cubic feet. The whole cost of this is not charged to plant, as, having the old gasholder there, we were bound to keep it up and support it, if necessary, out of revenue. An amount of £3300 was charged last half year to revenue, and similar amounts in the preceding half year, and in the current half year. The gasholder at Greenwich is an entire addition to plant, rendered necessary by the increased consumption of gas there. In regard to these and other works, we are not obliged to go outside for assistance in designing and erecting them, as we have Mr. Woodall, of the Vauxhall, and Mr. Wates, of the Greenwich stations, capable of giving us good designs for these and other constructions, and seeing them well and carefully carried out. An additional main of larger size has been laid in various parts of the district. I need not say that this is a thing which must be done in a growing Company. The present pipes are found to be too small, so that there is an increased pressure of gas over the district, causing a greater leakage, and necessitating also a larger supply. A call of 10 per cent. on the new stock will be required, payable on the 1st of July next. We are getting to the end of our capital. There is now 30 per cent. only to be paid on this stock, and the Board are careful about calling up unnecessary capital. We do not want to go to Parliament if we can help it; but this is an urgent matter. To show how reluctant we are to call out capital, I may say the whole of this has been already expended. We anticipated those requirements, and pay a large amount out of revenue until the call comes in. With regard to plant, we have a large new retort-house at Vauxhall ready for work next winter, in which the retort-benches are being fixed, and that, with the gasholder referred to, will keep us going, no doubt, for a few years. We have also room at Vauxhall for another gasholder. The report states: "A considerable amount of work in restitution and improvement has been executed during the half year." This is incumbent on the Directors to attend to, so that your plant will not be out of order, and depreciated in value. I may also state that the coal lifting has been a matter of great consideration with your Board and with the officers. Hitherto, our method has been to have the coal delivered into barges, and taken up to the various stations, with the exception of Greenwich, where, from its position on the river, we are able to land the greater part of the coals direct from the ships. We thought to have a pier on the river, and applied to the Thames Conservancy; but they were averse to it, saying it would interfere with the traffic. We had several schemes, but the plan was adopted to deepen the river bed at the wharf, and to repair the wharf, making it capable of accommodating a considerable steamer at the wharf side. As to the hydraulic apparatus, and the coal taken out in barges to two other stations—at Bankside and Vauxhall—this has been in full operation for twelve months, at a saving of about £5000 a year, according to our Engineer, who is rather sanguine; at any rate, there will be a saving in lifting our coals. The reduction of the price to 3s. 4d. per 1000 cubic feet, the report states, was effected as from the 1st of October last, and this has been attended with a satisfactory increase. The accounts show that a larger amount has been received for gas, notwithstanding this decrease; and the Directors are fully aware that our only plan to compete with actual inventions is to supply a good article as cheap as possible. We shall reduce the price still further as soon as we can; and although we have no immediate prospect of doing so, if things go on as they are we shall supply our consumers at even less. This 3s. 4d. is a lower price for our Company than many others. We have a large suburban district, extending from Eltham on the east to Wandsworth on the west, with a great number of mains. We used to have a differential price—an increase of 3d. on the country districts, which was considered fair; but, on the whole, we have considered it better to make a uniform price; so that that opprobrium is taken from us. During the past year we have kept our eyes open to any improvements in the manufacture of gas. The hydraulic stoker, for doing away with manual labour, has, to some extent, answered this purpose; but we were waiting for our friends, the large Company over the water, to see the result of their experiments. They have had one in operation, but from some cause or other it has not been so successful as they hoped it would be. In Manchester and the North these stokers are of very great service, and we are in contemplation to fit up a new retort-house at Vauxhall with one of these machines. We are also willing to take up any improvements by which more gas may be got out of the coal, and, for that purpose, at Vauxhall Mr. Woodall is experimenting with one or two improvements, by which it is hoped that greater purity will be effected in the gas, and there will be a greater yield. There is one subject I cannot sit down without alluding to, which, during the past year, has attracted a great deal of attention. I refer to the electric light. No doubt it is the strongest rival that has yet appeared in the way of gas for artificial light, and, during the past half year, it has been improved and developed to a considerable extent. There have been several papers read on the subject at scientific meetings; and one at the Institution of Civil Engineers, at which the Officials and Directors of this Company attended. The discussion extended over two or three evenings. One would have thought the inventors would have given a good sample of their light before such a body; but the light was an imperfect one. It was intensely brilliant, so much so that we were blinded with it, and it was quite a relief when it was turned down; but it varied a good deal, and made a disagreeable noise, which, for audiences inside a house, would be extremely unpleasant. For lighthouses, of course, it is an invaluable thing, and gas cannot compete with it, sending out, as it does, an intense light; you can see to read small print one or two miles off. You may also have seen, from recent experiments, that it is to be used on our men-of-war, to give notice of the approach of torpedoes. It is also proposed to light

the principal thoroughfares of traffic, such as at the Exchange and Charing Cross, as has been done in Madrid and Paris, and various other places. In all these cases it does not, of course, come into competition with gas; and there is no doubt that, for railway stations and large buildings, it may be partially used. Although it has been improved, there are many drawbacks in it. One of them is that you cannot divide the light—at least, when divided, you must have one machine to light various places, and you are obliged to light the whole or none. All consumers know that they can turn the gas on and have a small or a large light as they please. But with an electric light that cannot be done. They are able to divide, with the single machine, into two or three points, but these are obliged to be lighted at one time. A great deal has been said as to the cheapness of the electric light; but that cannot be proved until the Company have been formed, and the attendant expenses made known. I cannot see at present the slightest possibility of the general use of it. It may do for those special objects I have intimated, but for general purposes it cannot be used. The parallels drawn between gas and the electric light are very often absurd. Dr. Siemens, at Glasgow, lately showed that hundredweights of coal applied to the steam-engine of electric light would be equal to tons of coal in gas, ignoring entirely that the coals used chiefly for the electric light are done with, whereas from the manufacture of gas, coke is produced, and other residuals which are very important. I cannot do better, in closing my remarks, than refer to the statement of Dr. Siemens, who has introduced this light, made improvements on it, and has workshops lighted with it, and is very hopeful as to the future. In the number of the JOURNAL OF GAS LIGHTING for the 26th of March Dr. Siemens, in concluding his address at Glasgow, on the 14th ult., says: "For domestic purposes gaslight will long continue to hold its own, owing to the greater facility which it offers of subdividing the effects of light, and of accommodating its intensity to immediate requirements by simply opening and closing an ordinary tap." That is the opinion of Dr. Siemens, and in that opinion I quite concur. I do not think any of us need be alarmed as to the depreciation of our property. During the last twelve months there has been a little reduction in the Company's shares, but they are now increasing. The price quoted for our £20 shares is £39. I think any one investing in gas property ought to have a return of 5 per cent. Nobody can deny that electric light is used efficiently for many purposes, and in many cases it may come to compete with gas. It will take up part of our natural increase, but only a small part; but in reducing our gas supply I see no prospect whatever. With regard to the accounts now laid before you, they are very similar to those submitted on other occasions, but there are variations in several items. The capital employed in our manufacture is larger by £32,000 than it was at Christmas, 1877. This has been accounted for in the various items I have referred to. The amount received for gas is about £4000 more than for the corresponding half year, although the price has been reduced. For the heaviest part of the half year—the winter quarter—the price had been reduced from 3s. 6d. to 3s. 4d. The amount received for coke was rather less, owing to the exceptionally mild winter. We have had, of course, a quantity somewhat larger, but the price has been lower. The amount received for tar and other residuals has been very much the same. With regard to the expenditure on plant, it has been £32,000. The cost of coals has been less—somewhere about 10d. per ton less than in the corresponding half year. We do not expect the coals to be much lower. We have made all our purchases up to last March at what we consider cheap rates. We have a testing apparatus at Vauxhall, and any coals offered to us we test before buying them, because we prefer a good coal. The cost of manufacture has been very much the same, and also the cost of distribution. We have no control over the rates and taxes, which have been much about the same. The cost of management has somewhat increased, and by the next return may be increased somewhat more; but, in a concern of this kind, which is growing every year, as a matter of course the management must be considered. Our Secretary and Engineers cannot be expected to do an increased amount of work for the same pay as on former occasions; and when I tell you that the coals consumed last year are one-third more in quantity than they were six years ago, it will quite account for the increase under this head. With these remarks, I beg to move that the report and accounts be received, and entered on the minutes.

Mr. HOBSON seconded the motion.

Mr. WEBBER asked from whom the coals had been purchased this year.

Mr. HOBSON said he had some experience in purchasing coals, and he thought it was not a fair question to ask from whom they were purchased.

Mr. WEBBER: I want to go into this coal question.

The CHAIRMAN: I leave it to the meeting to decide whether I shall answer the question. We purchase Durham coals.

Mr. WEBBER: We all know that.

Mr. CYRUS LEGG thought it would operate against the interests of the Company if the question were answered. Supposing it was to be publicly stated what coal the Company were using, the price might be raised some 6d. or 9d. per ton by increasing the competition for that particular class of coal, and he thought it would be unwise for the Directors to say where they obtained their coal, or to give their opinion as to which they considered the best. There might be some coals at a low price, which, in the opinion of the officers, might be better than those for which 6d. or 9d. per ton more was charged.

Mr. WEBBER said that he held in his hand the "Analysis of the Metropolitan Gas Companies Accounts by Mr. Field," and was proceeding to enter into details, when

The CHAIRMAN said if it was the wish of the meeting that they were quite willing to hear those details, Mr. Webber could proceed. (No, no.) If he wished for information, he could apply to the officers at Bankside, but it was not a subject for conversation at a public meeting. In answer to Mr. Webber's question, he would refer to the analysis of the various accounts, which had been recently published. From that it appeared that the price of coal paid by the Phoenix Company was 15s. 1d., and this was the second lowest in the list, the lowest being the South Metropolitan, who paid 7d. per ton less; but they had special facilities for delivering the coals, which the Phoenix had not.



Mr. HOBSON again protested that the question was not a fair one to enter into. If the Shareholders had not confidence in their Directors, they could remove them.

The CHAIRMAN said that the gentleman who was now endeavouring to investigate the coal question was an agent for a particular class of coals, which were brought before the Company for trial. A sample had been tried, and 20,000 tons had been ordered and worked in the experimental benches, and also throughout the whole of the works, and after working them with the greatest possible care, the Directors came to the conclusion, assisted by the Engineers and Secretary, and the whole of the staff, that these coals were not so suitable for the Company's use as other coals; consequently, they ordered no more of them.

Mr. LEGG said Shareholders were not there to discuss the question of colliery owners, they were there to discuss the interests of the Phoenix Gas Company; and he really submitted that, seeing the source from which the question had come, the meeting ought not to have its business interrupted by accusations of the particular sort which had been made. The Directors did the best they possibly could for the Shareholders. The observations that had been made by the Chairman certainly proved that a fair trial had been given to the gentleman who had put the question, and that they had found the coals were not so economical for the Company as some other descriptions. If the gentleman he had referred to was really speaking as a disappointed man because he had not obtained an order for a larger quantity of coals, then the meeting would quite understand his conduct. Otherwise, he thought such questions were quite contrary to the business of the meeting.

The motion for the adoption of the report and accounts was then put and carried unanimously.

Mr. LEONARD SHUTER moved—"That dividends be declared on the various stocks at the usual rates during the last half year." It would be seen from the accounts that the requisite amount for this dividend had been fairly and properly earned, and the Directors, looking after the interests of the consumers, had not forgotten the interests of the Shareholders. In the past half year, in spite of all drawbacks, the same dividend had been earned, and a very fair amount had also been added to the reserve-fund.

Mr. HARRIS seconded the motion, which was carried.

Mr. HOBSON having been called to the chair, for the purpose of conducting the re-election of the Directors—all of whom, according to Act of Parliament, retired—proposed a formal resolution with that object.

Mr. LEGG said that as at the present moment the Company had no Directors the Shareholders might discuss the duties of the Directors, and what they had done for them in the past. He, for one, had a very great deal of confidence in the Directors of the Company, and was quite sure that they would do as well in the future as they had done in the past. He did not think there was a Company who had more intelligent or more deserving Directors than the Phoenix. When he pointed out what they had done in the past, he thought the Shareholders would be a little surprised. In 1862 the quantity of coals used amounted to 75,000 tons, and this had increased during the past year to 168,000 tons. The quantity of gas made in 1862 there was no register kept of, but he found in 1877 the amount had been 1,698,459,000 feet, which was an enormous quantity. The rental had increased since 1862 from £140,000 to £240,000, which was almost double. The number of consumers in 1862 was 14,000, and in 1877 it was 27,000. The paid-up capital in 1862 was £522,000, and now amounted to £1,121,000, which was more than double. The annual income of the Company in 1862 was £122,000, and in 1877 it was £360,000, showing that the work had considerably increased, and that the anxieties of the Directors and Officers of the Company had also increased; but when he told them that in this particular period the reserve-fund had increased

from £7000 to £103,000, that would show that the Directors had been making provision for the future, although there had been such good dividends paid for the last few years. In 1862 the price of gas was 4s. 3d. and 4s. 9d.; now it was 3s. 4d.; so that while the Directors had been studying the interests of the proprietors, they had not forgotten the interests of the consumers. The Company were not a small concern. The Phoenix were, next to the Chartered, the largest Gas Company in London. They had got three gasholder stations at Greenwich, Bankside, and Vauxhall, which certainly must necessitate much supervision. On looking at the accounts, he was rather surprised to find that on a rental of something like £137,000 for the last half year, the bad debts, including those that possibly may have been made by the sale of residual products, were only £578. This showed that the collectors must have been very well looked after, and also that those to whom they sold their products were good and safe customers. He was one of those who thought that gratitude was the best of virtues, and if they recollected that on a recent occasion the Directors gave the Proprietors a substantial bonus, in allotting to them shares, he thought they ought to evince their gratitude in some way. It seemed to him that when the Directors issued the shares he had referred to, they had full confidence that they would be enabled to maintain the dividend, and they had at present such confidence, notwithstanding the electric light. Seeing that the work of the Directors had considerably more than doubled within the last few years, he hoped that it would not be considered out of order if he proposed that their remuneration for the future should be £3000 instead of £2000. This he begged to move as an amendment.

The CHAIRMAN pointed out that the motion for the re-election of the Directors had not yet been seconded, and that the election had better be then proceeded with, after which Mr. Legg could bring forward his amendment.

Mr. LIVESSEY seconded the motion for the re-election of the Directors, which was unanimously adopted.

Mr. HORNER and Mr. SHAND were re-elected Chairman and Deputy-Chairman respectively, and Mr. R. P. Griffiths and Mr. S. T. Fisher were re-elected Auditors.

Mr. LEGG said, after the observations he had already made, he would not take up the time of the meeting, because he was satisfied that the feeling of the Shareholders would be with him. He would point out that the Commercial Gas Company, with a capital of £635,000, gave their Directors £3000 a year; the Surrey Consumers, with a capital of £290,000, voted to the Directors £2000 a year; while the London Gas Company, with a capital of £863,000, voted 300 guineas a year each; so that he did not think the Proprietors of the Phoenix would object to give the Directors the sum of £3000 a year, in consideration of the way in which the business had hitherto been conducted. He did not think the Shareholders could pay the Directors a better compliment than by carrying the motion unanimously.

Mr. ROBINSON seconded the motion. As men of business, they knew that good service ought to have good remuneration. The report and balance-sheet were of the most satisfactory character.

The resolution was put and carried unanimously, and on a further motion a sum of £200 was awarded to the Auditors, instead of £100 as last year.

Mr. SHAND then resumed the chair, and, on behalf of himself and Directors, returned thanks for the confidence which had been reposed in them. They had always done their best in the past, but this renewed expression of confidence on the part of the Shareholders would be a further stimulus to their efforts in the future.

A vote of thanks to the officers brought the proceedings to a close.

SURREY CONSUMERS GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held at the Terminus Hotel, London Bridge, on Monday, April 1—B. DUVAL, Esq., in the chair.

The Directors report was as follows:—

The Directors have pleasure in submitting to the Shareholders the balance-sheets, according to the prescribed form, for the half year ending the 31st of December last. The revenue account shows a profit of £14,970 13s. 11d., which, after providing for interest on debentures, will admit the payment of the statutory dividend at the rate of 10 per cent. per annum, and leave a balance to be carried forward to next account of £2162 1s. 7d.

Dr				1.—REVENUE ACCOUNT, for the Half Year ended Dec. 31, 1877.	Cr
To Manufacture of gas—					
Coals, including dues, carriage, unloading, and trimming				£21,700 15 7	
Salaries of Engineers, Superintendents, and other officers at works				675 0 0	
Wages (carbonizing)				4,854 9 6	
Purification, including labour				889 12 8	
Repairs and maintenance of works and plant, materials, and labour				7,687 15 10	
				£35,807 13 7	
Less old materials sold				222 9 0	
					£35,585 4 7
Distribution of gas—					
Salaries and wages of officers (including rental clerks)				£280 16 8	
Repairs, maintenance, and renewal of mains and of service-pipes, including labour				3,118 14 8	
Repairs and renewals of meters				618 9 7	
Public lamps—					4,018 0 11
Lighting and repairing					794 15 7
Rents, rates, and taxes—					
Rents payable				£103 16 1	
Rates and taxes				1,923 13 6	
Management—					
Directors' allowances				£1,000 0 0	
Company's Auditors				52 10 0	
Salaries of Secretary, Accountant, and Clerks				574 8 0	
Collectors' commission				412 14 0	
Stationery and printing				127 3 2	
General charges				334 2 4	
				2,500 17 6	
Parliamentary charges				43 15 6	
Bad debts				241 16 0	
Discount allowances				160 2 8	
Public testing-stations				15 0 0	
					2,500 17 6
Total expenditure				£45,387 2 4	
Balance carried to profit and loss account, No. 3.				14,970 13 11	
				£60,357 16 3	

The Directors have, since the completion of this balance-sheet, invested the sum of £10,000 in Consols, for the purpose of constituting a reserve-fund. The amount will be subtracted from the balance of profit and loss in the next account.

The depreciation-fund presents a balance of £6000.

The charge for gas throughout the district has been reduced to 3s. 9d. per 1000 cubic feet since the end of the Christmas quarter.

The Directors who retire on this occasion are Cornelius Nicholson, Esq., and William Black, Esq., who, being eligible, offer themselves for re-election.

William Westcott, Esq., the Auditor, also retires, and, being eligible, offers himself for re-election.

By Sale of gas—				Cr
Common gas, per meter, at 4s. per 1000 cubic feet				£40,060 4 6
Public lighting and under contracts				7,362 1 4
				£47,422 5 10
Residual products—				
Coke, less labour and cartage				£7,571 5 11
Breeze				112 4 3
Tar				1,945 3 9
Liquor				2,051 18 7
				11,680 12 6
Rents receivable				194 8 3
Transfer fees				4 17 6
Rental of meters				1,055 12 2

Total receipts . . . . . £60,357 16 3

2.—CAPITAL ACCOUNT.

To Expenditure	Expenditure to June 30, 1877.	Expended to this Half Year.	Total to Dec. 31, 1877.	Certified Receipts.	Received during Half Year.	Total Receipts to Dec. 31, 1877.
To Expenditure	£289,521 13 5		£289,521 13 5	By Ordinary shares of £10 each	£150,000 0 0	£150,000 0 0
Balance			478 6 7	" " £10 each, £8 paid.	80,000 0 0	£230,000 0 0
			£290,000 0 0	Mortgages and bonds		60,000 0 0
						£290,000 0 0



## 3.—PROFIT AND LOSS ACCOUNT.

To Interest on mortgages and bonds to Dec. 31, 1877	£1,452 7 4	By Balance from last account	£26,336 9 8
Balance applicable to dividend on ordinary share capital	28,498 11 3	Less dividend on ordinary capital for the half year ending June 30, 1877	11,356 5 0
			£14,980 4 8
		Amount from revenue account, No. 1.	14,970 13 11
	£29,950 18 7		£29,950 18 7

## 4.—GENERAL BALANCE-SHEET.

To Capital—		By Cash at bankers	£15,525 9 4
For balance, per account No. 2	£478 6 7	Coals, for stock on hand.	3,034 15 0
Net revenue—		Gas-rental—	
For balance, per account No. 3	28,498 11 3	Balance of this account due to the Company on Dec. 31, 1877,	
Debiture interest for amount due to Dec. 31, 1877	1,452 7 4	less deposits and prepayments.	32,128 19 7
Unclaimed dividends	141 7 5	Coke and other residuals	3,942 0 3
Sundry tradesmen and others, for amount due for coals, stores, and sundries	18,370 11 1	Sundry accounts	123 10 11
Depreciation-fund	£8,000 0 0	Cash in office	186 8 7
Less renewals	2,000 0 0		
	6,000 0 0		
	£54,941 3 8		£54,941 3 8

The CHAIRMAN, in moving the adoption of the report and statement of accounts, said: I do not know whether you, gentlemen, are satisfied with the report, but, personally, I am. We have for a very long time been anxious to place a sum of money in the Consols as a reserve-fund, and we have now invested £10,000 in Consols, and we carry over a very good balance—£2162. That appears to me to be a most satisfactory state of affairs after we have reduced the price of gas 3d. per 1000. Our rental is nearly £96,000 a year, and a reduction of 3d. per 1000 means taking off a clear income of £6000. We need not have done that at present, because our reserve-fund, which is now £10,000, might be raised to £25,000 before we reduced the price. As, however, our neighbours go on reducing, we are willing to follow their example. We are perfectly satisfied when we can see our way to make 10 per cent., and to give the public the benefit of the other £6000. But you must bear in mind that we were the last Company in the field, and had a great battle to fight against three most important Companies. We were consequently driven to a very large outlay, which was not the case with the other Companies. The South Metropolitan went in quietly, and purchased their plant out of money that ought to have been paid to their Shareholders, so that they are like a man who has a freehold in comparison with one who has only a leasehold. We are, however, perfectly satisfied with the way we are going on. We have no cause to complain of trade; in fact, we have rather too much for our plant. On one side, and at the back, we are hemmed in by the Commercial Docks, on another side by the street, and in front by the river. Some few years ago we purchased the King's Mill, but there was a lease of six or seven years upon that, and therefore we must wait before we can extend in that direction. We got the back premises, and built retort-houses there, but we shall not get the front till next Michaelmas. We shall then be able to make our works as good as any in the Metropolis. By carrying our wharf out a little further, we shall be equal to Beckton for landing; but what we want most is gasholder room. We cannot get the necessary land freehold, and if we get it leasehold we shall have to pay a fabulous price for it. No doubt, however, we shall be able to obtain it in time. The other Companies took all the cream of our district, and we had only the skim; but there is a large tract in Deptford where houses of a good class are springing up like mushrooms, and by patiently waiting we shall ultimately get to the front, instead of remaining in the background. If we can get land and build gasholders, we shall have nothing to fear and nothing to complain of.

Mr. NICHOLSON seconded the motion.

Mr. FRANKLIN said it occurred to him that, after the long interval which elapsed during which the price of gas was not reduced, it might have been desirable to give the public a greater benefit before forming the reserve-fund. He was afraid that what had been done would cause some little dissatisfaction outside. A reduction had been made; but it appeared that there had been an unappropriated profit of £10,000 since.

The CHAIRMAN: No; it has been lying at the London and Westminster Bank on deposit.

Mr. FRANKLIN thought most Shareholders would have assumed from the report that it was increased profit over and above what was now being divided.

Mr. NICHOLSON said if Mr. Franklin had rightly understood the point he would not have made the observations he had. The reduction commenced at Christmas last. The £10,000 had not accrued last half year, but had been a gradual accumulation for a great number of years. The profit and loss account showed a balance of about £15,000, and out of that the £10,000 had been invested, so that it did not at all affect the question of reduction of price. As it was invested in Consols, it would always be available if the dividends should at any time happen to fall off. If coals rose, the reduction of 3d. per 1000 might lower their dividends, and then the £10,000 could be utilized.

Mr. LOVEJOY said if the £10,000 had been accumulating for several years it ought to have produced interest, which the Shareholders should have had the benefit of. He thought the better plan would have been to reduce the £60,000 debentures.

The CHAIRMAN said the debentures could only be reduced by calling up the amount due on shares.

The SECRETARY said the Directors had no power to apply the £10,000 to the reduction of the bonds, because the bonds formed part of the capital of the Company.

Mr. NICHOLSON said Mr. Lovejoy was mixing up capital with revenue. The question of the debentures was one relating to capital, while the question of the reserve-fund related to revenue.

The resolution was carried unanimously.

Mr. FRANKLIN proposed the re-election of Messrs. Nicholson and Black as Directors.

The motion was seconded by Mr. SMITH, and agreed to.

Mr. NICHOLSON and Mr. BLACK thanked the meeting for their renewed mark of confidence.

Mr. WESTCOTT was re-elected Auditor, and the proceedings terminated with votes of thanks to the Secretary, the Engineer, the Board of Directors, and the Chairman.

TRANSFER OF THE ILKESTON GAS-WORKS.—At the meeting of the Ilkeston Local Board, on the 2nd inst., the Clerk reported that the agreement between the Board and the Ilkeston Gas Company for the sale of the Ilkeston Gas-Works, &c., to the Board, for the sum of £25,000, and a sum not exceeding £600, for expenses of the Company in applying to Parliament for special powers, in which application they were opposed by the Board, had been accepted by the Company.

## ALLIANCE AND DUBLIN CONSUMERS GAS COMPANY.

The Half-Yearly Meeting of Shareholders was held on Saturday, the 30th ult.—EDWARD FOTTELL, Esq., in the chair.

The SECRETARY and MANAGER (Mr. W. F. Cotton) read the following report of the Directors:—

The Directors, in submitting a statement of accounts and balance-sheet for the half year ended the 31st of December last, congratulate the Proprietors upon the steady progress of the Company's business.

The gross revenue amounts to £118,321 14s. 7d., the expenditure, inclusive of bond and debenture interest, being £51,835 1s. 1d., leaving a net profit on the half year's working of £36,486 13s. 6d., which added to the sum of £8277 10s. 10d., carried forward from previous accounts, gives a total sum of £44,764 4s. 4d., from which the Directors recommend payment of a dividend at the rate of 10 per cent. per annum, free income-tax. This will absorb a sum of £29,500, and enable the Directors to carry over a surplus of £15,264 4s. 4d. to next half year's account.

The Directors have to report that, in compliance with the statement made last half year, the expenditure connected with the construction of the new roof over No. 1 retort-house has been paid out of the contingent-fund. The balance to credit of that fund now stands at £2710 7s. 3d.

The works and plant of the Company are in excellent condition, being well maintained and improved in every department.

Since the last half-yearly meeting of the Company, debenture stock to the amount of £15,000, bearing interest at the rate of 4 per cent. per annum has been issued, in lieu of bonds upon which interest was payable at the rate of 4½ and 5 per cent.

Two of the Directors go out of office by rotation—viz., David Drummond, Esq., J.P., and Maurice Brooks, Esq., M.P.; both, being eligible, offer themselves for re-election. Charles Lawler, Esq., the Company's Auditor, also retires by rotation, but offers himself for re-election.

Dr.—Capital Account, for the Half Year ended Dec. 31, 1877.

	Expended this Half Year.	Total to Dec. 31, 1877.
Expenditure to June 30, 1877	..	£699,244 1 11
Expenditure on manufacturing plant, machines, storage works, and other structures connected with manufacture (not in place of old ones)	2,939 9 5	
New mains and service-pipes (not being in place of old ones), including laying same, paving, and other works connected with distribution	1,537 16 10	
New meters (not in place of old ones), including fixings, &c.	1,067 5 3	
Horses, carts, &c.	215 10 0	
Parliamentary expenses.	470 8 0	
		6,230 9 6
Total expenditure	..	£705,474 11 5
Balance of capital account	..	31,917 18 7
		£737,392 10 0

## Cr.—Capital Account.

	Certified Receipts to June 30, 1877.	Received during Half Year.	Total Receipts to Dec. 31, 1877.
Share capital	£589,892 10 0	..	£589,892 10 0
Bonds and debenture stock	147,500 0 0	..	147,500 0 0
	£737,392 10 0	..	£737,392 10 0

## Dr.—Revenue Account.

To Manufacture of gas—	
Coals, including dues, carriage, unloading, and all expenses of depositing same on works	£47,461 3 2
Purifying materials, oil, water, and sundries at works	707 12 1
Salaries of Engineers, including Chief Engineer, Superintendents, and officers at works	1,412 7 10
Wages at works	7,103 14 5
Repairs and maintenance of works and plant (including renewal of retorts), machines, apparatus, tools, materials, and labour	8,055 16 7
	£64,740 14 1
Less old material sold	28 13 10
	£64,712 0 3
Distribution of gas—	
Salaries of Surveyor, Chief Inspector, Inspectors, Assistant Inspectors, and Clerks in Light Office	1,214 15 2
Repair, maintenance, and renewal of mains and of service-pipes, including materials, laying and paving, and labour	1,317 1 7
Repairing, renewing, and refixing meters	1,495 17 9
Public lamps—	
Lighting and repairing	410 0 3
Rents, rates, and taxes—	
Rents	720 19 10
Rates and taxes.	2,403 1 3
Management—	
Directors' allowances	525 0 0
Salaries of Secretary, Accountant, and Clerks, Office-keepers, and Messengers	1,068 14 0
Collectors' commission	940 7 8
Stationery and printing	197 2 11
General establishment charges and incidentals	842 18 2
Auditor	15 0 0
Law and parliamentary charges	348 4 6
Bad debts	828 11 5
Abatements and allowances	612 6 11
Annuity account	450 0 6
	£78,102 2 2
Balance carried to profit and loss account	40,219 12 5
	£118,321 14 7



CR.—Revenue Account.

By Sale of gas—			
Gas (394,496,900 cubic feet), at 4s. 6d., 4s. 9d., and 5s. per 1000 cubic feet	£90,551	8	6
Public lighting and under contracts	6,047	0	9
Rental of meters	2,706	15	3
Residual products—			
Coke, less labour and cartage	11,038	4	2
Breeze	901	14	2
Tar	4,304	3	10
Ammoniacal liquor	2,227	17	4
Rents	223	12	1
Transfer fees	42	10	0
Ship Dispatch, money received	378	8	4
	£118,221	14	7

The CHAIRMAN, in moving the adoption of the report and accounts, said he was very happy to be able to inform his brother proprietors that the Company were working in a very satisfactory state; that, notwithstanding the reduction in the price of gas from the corresponding time of the previous twelve months, the receipts were not much diminished. The working had gone on so happily and pleasantly that, notwithstanding the diminished receipts from the reduced prices of gas, they were still enabled to maintain a dividend of 10 per cent., and to carry forward a balance to the next half year. The balance now brought forward, after the two half years, was a large amount—£15,264 4s. 4d. That balance had been left as a balance brought forward—for reasons he might explain to them—because it might appear to them, or to parties who had not so diligently looked into the affairs of the Company, that something should be done with that sum. They were allowed by Act of Parliament to make a contingent-fund, or a reserve-fund; but, if they adopted either course at present, according to their Act of Parliament, it would be compulsory on them to invest that amount in securities. Now, if they looked to the capital of the Company, they would find that the available amount was at present under £32,000. That sum would not be adequate to carry on the business of the Company, and if they had not the advantage of the surplus profit to make use of for a time, they would be bound to raise some of their new capital, which they were authorized under their Act to do. The consequence of doing so would be that they would have to raise capital at 7 per cent., which was the limit put on it by Parliament, and invest the other at 2 or 3 per cent., or at whatever sum they could get. Evidently, such a course would be prejudicial to the Shareholders, and also to the public at large—not so much, he might say, to the Shareholders—because he was very confident, from what he saw of the working of the concern, that the Shareholders need have no reason to entertain any doubt that the 10 per cent. dividend would not be kept up. But they must also look to the public at large. Where a Company had the whole control of the City of Dublin to supply it with gas, naturally enough they were looked up to to give every possible advantage to the consumers, and at the earliest possible moment to meet their wishes by a further reduction in price. He thought it right at once to give that explanation to the Shareholders, because without it they might say, very naturally, what were they doing with the £15,000; but he thought he had explained this much—that the Directors were not working for their benefit alone, but also for the benefit of the city at large. During the last half year they had brought 4½ and 5 per cent. debenture stock, to the amount of £15,000, down to £4000, so that they were working this gradually for a saving to the Company. Their next debenture stock would be due in November—£11,600 of 5 per cents.—the only 5 per cents. outstanding. If everything went on favourably, and the price of money in the country did not increase, owing to the political situation, he hoped they would be able next half year to redeem the 5 per cent. debenture stock, and issue it at 4. The works of the Company were all in good order. They were not sparing any fair and legitimate expense out of the revenue to keep up the works in a sound and good condition for the proper carrying on of their undertaking. In consequence of some letters that had come before the Board of Directors, and of which some of the Shareholders might not be aware, he thought it right to say a word. It was in reference to the scare of the electric light. He called it a “scare,” for any one conversant with it, or who had seen the working of it, would feel that it was not a light that would be applicable at all for lighting houses internally. If the electric light was used in the City of Dublin, the loss to the Company would not affect them, in regard to street-lamps or anything else, to the 1-16th part of a farthing. The Directors had it from the highest authority in the United Kingdom that the electric light could never be made applicable where gas was used.

Mr. E. M'CREADY seconded the resolution, which was passed unanimously.

The CHAIRMAN next moved that a dividend at the rate of 10 per cent. per annum be declared, and made payable on and after the 8th of April.

Mr. TALLON seconded the resolution, which was agreed to.

Mr. David Drummond and Mr. Maurice Brooks, M.P., were re-elected as Directors.

The CHAIRMAN said the next matter was the consideration of a proposition that the Company should contribute to a fund for the superannuation of their officers. The Board made no opposition to the project, as they deemed it best that a Shareholder should bring it forward for the decision of the Proprietors.

Mr. BRUNKEE said he was sure there was not a Shareholder present who would not deplore the fact that any officer of the Company, who spent the greater part of his life honestly, industriously, and efficiently in their service, should be relegated in his old age to want and privation; further, he was certain they would unanimously agree that it would not only be a humane, but a prudent course, to aid any movement which would prevent such a result. What he would propose was, not that the families of their officers should be provided for, but that some help should be given to the Company towards enabling provision to be made for their faithful officers when they were past their service. The officers themselves would contribute from their salaries to the fund, and he wished the Shareholders to understand that the help which he would ask from them would not really cost them 1s. Two annuities paid to retired officers had recently fallen in. Their amount was £300. Two other annuities—one of £500, the other of £200—were still being paid. What he would ask the Company to agree to was, that the amount of the lapsed annuities should go now, and the amount of the existing annuities when they fell in, to augment an annual subscription by the officers, for the purpose of providing a superannuation fund for their body. In consenting to this the Company were really losing nothing that they hitherto had, because the annuities had been a charge upon their funds, while on the other hand they assisted a benevolent purpose, and gave one of the strongest incentives to their officers to discharge their duties with zeal and fidelity. He might mention that the system was in operation in the Royal Bank and other institutions, and had been found to work well. He concluded by moving a resolution to the effect he had mentioned.

Mr. KERNAN seconded the proposition, which he considered a very reasonable one. He thought it a sound policy to contribute to a super-

annuation fund for their officers, and he was certain that the existence of such a fund would be a great stimulant to their officers.

Mr. SIMON CRAIG concurred in the movement, but thought Mr. Brunker's proposition should be put in a more precise shape.

The CHAIRMAN said the two lapsed annuities were £200, not £300, as Mr. Brunker supposed. He presumed what Mr. Brunker meant was that the entire annuity-fund should be applied to superannuation purposes, charged, however, with the existing annuities of £500 and £200, and that when these fell in they should go the fund also.

Mr. BRUNKEE: Exactly.

Mr. GALBRAITH said he had been an officer of the Company for 46 years. Having to retire from old age, the Board were unable at the time to give him any retiring allowance. Later on he applied again, and the Board were enabled to pay him a small sum weekly, having power to stop it when they chose. His case, he thought, showed the necessity of having a superannuation fund for their officials who had served them well.

After some further discussion, the proposition was agreed to unanimously.

Mr. Charles Lawler was then re-elected an Auditor of the Company.

The CHAIRMAN said that, having regard to the fact that there was a Government audit of the accounts, it would be for the Shareholders to say whether they would elect a second Auditor in the place of the late Mr. Askin. The Board left the matter altogether with the Shareholders.

Mr. MURPHY moved that Mr. Kevans be elected as the second Shareholders Auditor.

Mr. P. McCABE FAY seconded the motion, which was agreed to *nem. dis.* Mr. BROOKS, M.P., was called to the second chair, and, on the motion of Mr. CROSTHWAITE, seconded by Mr. JOHN HYLAND, a cordial vote of thanks was passed to Mr. Edward Fottrell.

Mr. FOTTRELL having briefly expressed his acknowledgments, the proceedings terminated.

SALES OF PROVINCIAL GAS SHARES.—At a property sale in the city of Worcester on Friday last, some £10 shares in the Worcester Gas Company realized £24 per share. On the same day, a sale of 330 Swansea gas shares took place at the Mackworth Arms Hotel, Swansea. The shares were put to auction, and realized £12,029. The shares are £25 paid up, bearing dividends of 7½ per cent per annum. The highest price reached at the sale was £37 per share; the average, £36 9s. per share. Before the sale, some shares sold as high as £38, and this has been the quotation for several months past. Should the Board of Health purchase the Company, we should not be surprised to see them go up to £46 or £48 per share, this being their value. The confidence expressed by the general public, of which there was a very large attendance from all parts of the county, must be gratifying to the Directors, Shareholders, and every one concerned. At Brigg, on the 28th ult., a number of £5 shares in the local Gas Company were sold by auction at from 48 to £9 each.

EAST LONDON WATER-WORKS COMPANY.—The half-yearly general meeting was held at the Company's office, St. Helen's Place, on Thursday, the 4th of April, when the following report was submitted and adopted:—“The Directors herewith submit to the Proprietors the half year's accounts to Christmas last, duly examined by the Auditors. The revenue from all sources, as there shown, amounts to £106,903 5s. 8d.; and the cost of maintenance and management to £39,656 0s. 10d. The expenditure on capital account during the half year was £13,324 13s. 7d., and the balance of unexpended capital is £20,153 7s. 9d. The works erected at Hagger Lane, to meet the large demand for water in the Essex part of the Company's district, are finished and in operation. Colonel Bolton, the Water Examiner, testifies to their working in a satisfactory manner. From the rapid increase of houses in this locality, the Directors have ordered a duplicate engine to be erected in the house already provided for the purpose. Possession of the land at Buckhurst Hill having now been obtained, the water tower, referred to in the last report, will be erected without further delay. The tolls arising from bridges at Hillier's Ferry, Walthamstow, and Chingford Mill, have been purchased by the joint Committee of the City of London and the Metropolitan Board of Works. The bridges are now free; the purchase-money, £4950, will appear in the capital account of the accounts to Midsummer next. On examination of the river wall at Old Ford, when the water was drawn off, it was found that settlements had taken place and several portions had fallen in; this will require immediate repair or renewal. With this exception all your works, machinery, and property are well maintained and in good order. Further notices have been given for the introduction of constant supply. 82,000 houses are now supplied upon that principle, being upwards of two-thirds of the whole number supplied by the Company. The quantity of water pumped during the half year was 4,969,717,633 gallons; for the whole year it amounted to 9,513,732,322 gallons; being an increase of 698 million gallons over the quantity pumped in 1876. The reports made by Colonel Bolton and Dr. Tidy as to the quality are highly satisfactory. Two Bills respecting the supply of water to the Metropolis have been introduced into Parliament this Session by the Metropolitan Board of Works, which the Directors have considered it to be their duty to oppose, jointly with the other Metropolitan Water Companies;—viz., one Bill for the introduction of an additional supply from deep wells, which has been read a second time; and another Bill for the purchase of the Metropolitan Water Companies, the debate on which has been adjourned, and the Government have declined to name a day for its further consideration. Three Directors go out of office by rotation—viz., Messrs. Helme, Dalton, and Oxley, but are all eligible for re-election. They have given notice in accordance with the Act of Parliament. One of your Auditors, Mr. Bird, also goes out of office, but is eligible for re-election. The Directors being of opinion that the balance on the dividend account, amounting to £80,084 13s., will now admit of the payment of a bonus, they recommend that a dividend at the rate of 3 per cent., with 1 per cent. bonus, on the ordinary stock, and of £2 5s. per cent. on the debenture stock, both clear of income-tax, be declared payable on the 10th of July next, in the usual manner.”

PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

930.—FINDLAY, J., and JACK, W., “Improvements in the destructive distillation of coal, shale, and other bituminous substances, and in apparatus or reborts employed therefor.” March 12, 1875.

999.—BROTHERHOOD, P., “Improvements in apparatus for forcing or compressing fluids or liquids.” March 18, 1875.

PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

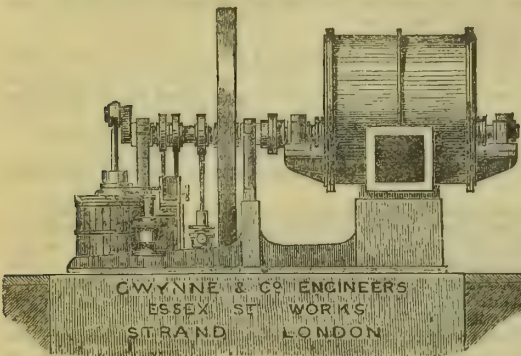
714.—OLVER, J. S., “Improvements in urinals and lavatories, and for regulating the supply and discharge of water and other liquids to and from the same.” March 17, 1871.

752.—COTTERILL, C. F., and BIDDLE, G., “Improvements in attaching taps or stopcocks to water, gas, steam, and other pipes, for making connections therewith, and in apparatus to be employed for that purpose.” March 3, 1871.



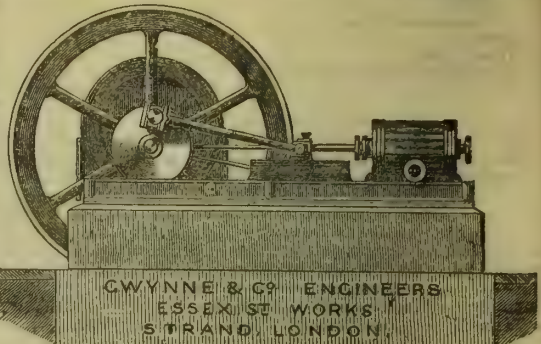
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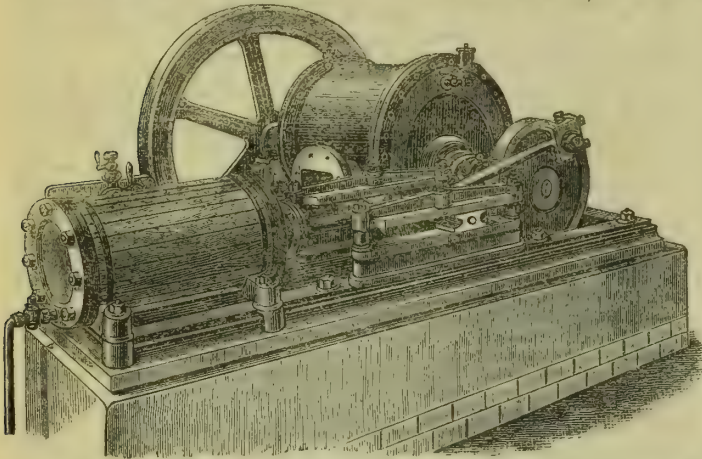
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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

TO SUBSCRIBERS.

In consequence of the Easter Holidays, the next Number of the JOURNAL OF GAS LIGHTING will not be published until Wednesday, April 24.

THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 16, 1878.

Circular to Gas Companies.

To mention the South Metropolitan Gas Company is only to call up in imagination the most prosperous statutory Gas Company, so far as Shareholders are concerned, in the kingdom. There are others in the country who supply gas at a cheaper rate, but who, for good or for evil, are at present deprived of the advantages which the sliding scale confers, and, therefore, do not pay more than ten per cent. The South Metropolitan are, we believe, the only statutory Company who are now dividing eleven per cent., and might, if the Directors so willed it, divide eleven and a half per cent. It is wise on their part, however, to appropriate a portion of the balance to the increase of their insurance-fund, and carry the remaining sum to the next account. We do not like to see old and familiar names disappear from the records of the management of Gas Companies, and may here express regret at the absence of the able and venerable Chairman of the Company from the meeting, which we report in another column; and also at the retirement of Mr. Beriah Drew. Both these gentlemen have done excellent service to the Company in the course of their careers, and their honest ploddings have contributed to bring the Company to its present position. But it may be that younger hands will be required to conduct the Company into the position which it might assume, as we cannot help

thinking it might become the organizer of a South London combination. The time is now quite ripe for this; and, although we shall not, at the present moment, pretend to forecast the future of the Metropolitan Gas Companies, we are quite certain that their direct and permanent interest must lead in the direction of amalgamation. Towards this object the South Metropolitan Company, who have never exercised a selfish policy, might greatly contribute. We feel satisfied that the Directors will presently have this matter forced strongly upon their attention, and we shall be content to leave it in their hands. The increased remuneration of the Directors has been well earned, and we are glad to see that the Shareholders unanimously voted the additional honorarium.

The Sheffield United Gas Company have another prosperous undertaking which pays full dividends, and might, if the law allowed, divide more than the present maximum. Through good and evil report the Company have gone on fairly discharging their duty towards the public. A reference to the Chairman's speech will show, so far as illuminating power is concerned, how well this duty is fulfilled. The Company's Act, we believe, requires sixteen-candle gas to be supplied. When that Act was passed the Sugg-Letheby burner was in general use, and the Company continue to use that burner to the present day. According to the tests applied, both by the Company and the Corporation, the gas actually supplied considerably exceeds in illuminating power that required by the Special Act, and, if tested by the new "London" burner, as it will be when the Company again go to Parliament, the quality is enormously in excess. The Sheffield consumer may, therefore, rest well content with the gas he gets at the low rate of 2s. 9d. per thousand, and a prospect of an early reduction to something less. The considerable balance left in the hands of the Directors, after paying the half year's dividends, and the large reserve-fund, make it easy to carry into effect the proposed reduction at no distant time. That favourable coal contracts have been made is a further guarantee, and we may heartily congratulate the Sheffield Gas Company and their customers upon the happy result of the past half year's working.

The Gas Committee of the Corporation of Hereford have lost no time in reporting, on a reference made to them by the Town Council, as to the selection of a site for new gas-works. There was one ready to their hands, and they secured it. It is six acres in extent, and will cost £5000. It is estimated that to complete the gas-works, to be erected upon it, a cost of £30,000 will be incurred, which sum, as a matter of course, the Corporation propose to borrow, with the sanction of the Local Government Board, and pay off in the course of fifty years. This is not a large debt for productive works, and those who, like ourselves, are somewhat frightened at the rapidly increasing liabilities of municipalities, need not be anxious in this instance. Whether the Gas Committee have done wisely or not in purchasing second-hand plant we cannot say. The saving they have effected is comparatively small. The new works will be commenced immediately—at all events, as soon as plans for their construction have been prepared; and in the course of twelve months, we may presume, the good people of Hereford will be blessed with gas-works to last them for a long time to come.

The Lea Bridge Gas Company have succeeded in carrying their Bill before a Committee of the House of Commons, with but slight and unimportant modifications. The standard price was reduced by the Committee from 5s. 6d. to 5s. per thousand, with the usual standard rates of dividend on old and new capital. We are sorry to find that some of the opponents of the Company, notwithstanding the advantage they have gained, have resolved on carrying their opposition to the House of Lords. We do not believe they will take anything by their motion, and regret to see the money of the ratepayers of Leyton wasted in fruitless proceedings. It is impossible that gas in a district such as is supplied by the Lea Bridge Company, could be furnished at a very low rate; but the great incentive to a cheap supply would, of course, be the operation of the sliding scale. It is absurd to argue, as, we regret to say, some people in that neighbourhood do, that the standard price, being fixed at 5s., gas will never be lower; nor is it fair to institute comparisons between the circumstances of the West Ham and Lea Bridge Companies. The former have a comparatively densely populated district, while the latter have extensive limits, which are being but slowly built over. These facts ought to make the Local Boards who oppose the Company content with their partial triumph. We have the minutes of evidence taken before the Committee, the publication of which we hope to commence next week.

A deputation from the Hastings Gas Consumers Committee have waited upon the Directors of the Hastings Gas Company,



to urge upon them the desirability of reducing the price of gas. We shall not dispute the fact that gas at Hastings is somewhat dear; but how, under present circumstances, the Company can make it cheaper, we do not exactly see. No doubt, if the Company would cease from the practice of paying back dividends, a little might be done for the consumers. Still, however, the arguments put forward by the deputation on this point are perfectly fallacious. They ignored the fact that the law gives the Company the right to make up back dividends—a right which no member of the deputation, in his own individual capacity, would neglect to exercise. The plea that many of the shares have changed hands, goes for nothing, for every purchaser paid for, and took, the shares with all their attendant risks and advantages, among the latter being the prospect that, at some time or other, the Company might be able to make good arrears. It is very difficult to institute a completely satisfactory comparison between the circumstances of any two Companies, so varied are the elements to be taken into consideration. Most certainly it is not fair to compare the Hastings with the Brighton Companies. It would take too much of our space to show why gas at Brighton ought naturally to be cheaper than gas at Hastings; still we may express a hope that the Hastings Directors may soon see their way to reduce the price. The duty on coals paid at Hastings goes, of course, to the advantage of the ratepayers, and so far is equivalent to a reduction in the price of gas. If this impost, which exists in but few towns in England, were abolished, Hastings might at once have cheaper gas; but then it might be argued that the gas consumers would be benefited at the expense of the general ratepayers. The Directors have not, as yet, given any decided answer to the deputation, whom they very courteously received.

The Gas Committee of the Corporation of Bradford have just received what may be termed a windfall. It seems that the old Bradford Gas Company, seven years ago, contracted to dispose of the whole of their ammoniacal liquor for £800 a year. That contract is just about to expire, and the Corporation, to whom the gas-works were soon after transferred, having advertised for tenders, have received one offering them £10,600 a year. Of course, the quantity of liquor produced now is considerably in excess of that made in the Company's time; still the disparity in price is very remarkable, for seven years ago liquor was beginning to rise in value. It may be mentioned that the contractor, who has hitherto paid £800 a year, has recently offered the Corporation £8000 a year; so we need not hypocritically express a hope that his business for the past seven years has been a very profitable one. It is gratifying to find that Corporations and Gas Companies alike become more and more alive to the value of residuals, which, in our opinion, will continue to increase. It is amusing to read in a Bradford paper that the increased value of ammoniacal liquor is to be ascribed to its utilization in the production of aniline colours.

The Corporation of Wigan have had a small fine inflicted upon them for not filing their gas accounts, in acquiescence to statutory requirements; they will now be wiser, and for the future will doubtless conform to the law.

The Chief Gas Examiner for the Metropolis, an abstract of whose report will be found in another column, is again able to state that the Companies under his supervision have, during the past quarter, strictly complied with the requirements of the law. We have said Companies, but, as a matter of fact, the testing-stations of the Commercial Company have been closed for the quarter, and we have no returns relating to them. In our simplicity, we entertain an idea that a week would be quite sufficient in which to put a testing-station in order. There are those among the members of our Local Authorities who consider gas-testing a farce. We do not agree with them, but we can easily imagine that the spectacle of a Gas Examiner with nothing to do for three months must annoy the economists.

The water schemes of the Metropolitan Board have received their *quietus* at the hands of the Government. The Water Purchase and Supply Bills having been lost, there is no knowing to what that restless, meddling body may now turn their attention, and we should not be surprised to find that next session they made another assault on the Gas Companies. It may be that the Government will propose to deal with the Gas and Water Questions together, but at the moment we write we have no information as to their intentions.

On Saturday evening an experiment was made with Mr. Lane Fox's invention for simultaneously lighting and extinguishing gas-lamps by means of electricity. This invention has been fully described in our columns. In this instance we were informed that fifty-five lamps in Waterloo Place and Pall Mall West were placed in circuit, a number a little in excess of those experimented with at the Fulham works of the Chartered Gas

Company. Out of the fifty-five, about ten, we believe, proved obstinate—some would not light, and some, when lighted, refused to be put out. It must be understood that we do not quote this experiment as either a failure or a success. It was neither one nor the other. We have little doubt that Mr. Lane Fox will, after some—it may be long—perseverance, perfectly succeed in what he desires to accomplish; and the only thing that remains to be considered is the *cui bono*. The first thing the invention proposes to effect is the saving of gas. This will really be small; for as the lamplighter goes his rounds he turns on the tap of each individual lamp, and lights it, and no gas is lost. The next saving proposed is the suppression of the lamplighter; but as the lamp-cleaner must inevitably be retained, and the two men are really one, we do not see exactly how any direct saving can be made in this direction. Still, it may be admitted that, under some circumstances, and especially when gas is supplied by Corporations, or under the average meter system, some advantages may be gained when the invention is perfected. At the present moment, we do not see what may be gained by Gas Companies who supply under the ordinary contract system. We are unwilling, however, to offer the smallest discouragement to any really scientific invention, and we regard this of Mr. Lane Fox's as one of much excellence. We were informed that the electric power which he uses at present is capable of lighting and extinguishing three hundred lamps; and a battery being placed in a convenient position, the current may be sent in different directions, so as to operate upon an equal number of lamps in several districts.

### Water and Sanitary Notes.

THE Metropolitan Water Companies are naturally very anxious to ascertain the intention of the Government as to the second reading of the Purchase Bill promoted by the Metropolitan Board of Works, and for this reason they obtained another interview with the Home Secretary on Thursday last. Their specific object was to elicit from the right honourable gentleman, if possible, what answer he would give to the question which Mr. Fawcett, M.P., put to him last night. The question was as follows:—"Whether he would consent to the appointment of a Select Committee to inquire whether the Water Supply of London should continue to be in the hands of private Companies; and, if not, to what public body it should be entrusted, and on what terms the rights of the existing private Companies should be acquired?" The Companies appeared to think that Mr. Fawcett's object was to secure a second reading of the Bill without discussion, in order that it might be referred, in the usual way, to a Select Committee upstairs. This, however, may not have been the object of the honourable Member for Hackney, whose wish was, perhaps, to obtain a Committee with wider powers of recommendation than ordinary Select Committees obtain. The Home Secretary, however, declined to give a direct answer, but promised, after consultation with his colleagues, the President of the Local Government Board and the Chancellor of the Exchequer, to be prepared with a reply to Mr. Fawcett. Last night the question was answered, in the absence of the Home Secretary, by Mr. Selater-Booth, and the reply was, for us, sufficiently explicit. The Government do not see any necessity for the appointment of a Committee to consider matters which have already been reported upon over and over again. Further than this, they express their readiness to deal with the whole question when it becomes ripe for legislation. *Sic transeunt* some thousands of pounds of the ratepayers' money wasted by the Metropolitan Board of Works. We hope this august body will be as satisfied with Mr. Selater-Booth's reply as we are, and as the ratepayers at large have good reason to be.

We understand that the arbitrators in the matter of the Stockton and Middlesbrough Water-Works purchase have made their award, and a few days ago the joint Boards gave a cheque for £5300, and took it up. The terms settled have not yet been made known, but we shall learn them in a few days. Whatever they may be, however, we may take it for granted that the joint Boards will have no reason to congratulate themselves on having acquired a bargain. They will pay dearly for the honour of being the first to make a really compulsory purchase of a Water Company.

The Richmond (Surrey) Water-Works are not yet completed. The Vestry have already expended £36,000 upon them, and now have applied to the Local Government Board for permission to borrow a further sum of £4000, to carry out works which it is estimated will cost £3974. This is sailing very near the wind. The additional sum, it seems, is not required to improve the sources of supply, although the well is in anything but a satisfactory state, but is wanted to provide for the extension of the



mains into districts which are rapidly being built over. What the quality of water supplied to the inhabitants of Richmond now is we are not informed, but we think we may assume that a great part of it comes indirectly from the Thames, and is not efficiently filtered. Perhaps one of these days the Registrar-General will think it right to include analyses of the water supplied to Richmond in his monthly returns.

Dr. E. J. Mills has discovered that the much vaunted Loch Katrine water supplied to Glasgow requires filtration before it is fit to be used for drinking purposes. According to his annual report, an abstract of which will be published next week, it is more fully charged with organic impurities than is generally supposed. Speaking for ourselves, we excessively dislike it, and are not surprised that Scotchmen are disinclined to drink much without some qualifying admixture. The prospect that the water will have to be filtered on a large scale cannot be pleasing to the Corporation of Glasgow, since it will involve a very considerable outlay. We imagine that domestic filtration is no more common in Glasgow than in London, and among those who drink the largest quantity of water it is never practised at all. We may take it that the danger suggested by Dr. Mills, of typhoid fever being spread over Glasgow, in consequence of a few houses and an hotel emptying their sewage into the river which runs into the lake, is a fanciful one. Dr. Mills's remarks on the effects of the absence of sunlight on the water are of considerable interest.

The Bristol Water-Works Company are, as our readers know, very prosperous. The profits for the past year enable them to pay maximum dividends, and make up some arrears, leaving them a small balance to be carried forward. The Company have now got rid of all opposition, and the Town Council of Bristol, having given up the idea of purchasing the undertaking, the Company have opened before them the happiest of prospects. They are about to issue a considerable amount of new capital, which is required for the expansion of the undertaking. This is likely to be immediately remunerative, so that while the Shareholders benefit, the Bristol public will not suffer. A report of the proceedings at the annual meeting recently held will appear in next week's JOURNAL.

### Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

#### TESTINGS FOR ILLUMINATING POWER AND THEIR DIFFICULTIES.

SIR,—It afforded me much pleasure to find, in your last issue, my esteemed friend, if he will allow me to call him so, Mr. John Reid, again coming forward with suggestions and matter for the exercise of thought, not only on the part of the younger members of our profession, but also on the part of those who, like himself, have had years of practical experience.

The problem which Mr. Reid desires to be solved is a very difficult one, because all the factors which go to make up the equation are not, as I conceive, really known, and he will, I am sure, pardon me for saying that the statements which he puts forward require to be supplemented by others before any proper conclusion can be deduced.

In the "Remarks on Photometry," which I had the honour of reading before the British Association of Gas Managers in the year 1870, I drew specific attention to the possible errors which might occur in the indications of the jet photometer, as used by the late Mr. George Lowe, and of the durability test, as employed by the late Dr. Fyfe, and after some reasoning on the subject, said, in respect to the latter test:

"The durability test, pure and simple, may not be entirely free from possibility of error, for although the determination of value is dependent on time and volume, or, what is the same thing, on the rate of consumption, yet if flames produced by consumptions of equal weights of a combustible become enlarged or reduced as the atmospheric density diminishes or increases, it may be that equal volumes of gas will at different atmospheric densities produce flames of equal length, and thus lead at times to the under or over estimation of the illuminating power of the gas."

If my reasoning be correct, it follows that every determination of the value of a gas by the jet photometer of Mr. Lowe, or by the jet as used by Dr. Fyfe and his successors, should be accompanied by corrections for barometric pressure, and for temperature, just in the same way as is now done in London, under the Referees Instructions, in the estimation of the illuminating power of gas with the Bunsen photometer.

The information required to supplement the particulars which Mr. Reid has given are, as far as I can see at the moment, to be found in answers to the following questions:—

1. Was the volume of gas produced per ton of coal, or of cannel, in every case reduced by calculation to standard volume at 60° Fahr. and 30 inches barometer?
2. Was the volume operated upon with bromine also so reduced?
3. Were the volumes used with the durability test and with the Bunsen photometer also so reduced?
4. What were the specific gravities of the several samples of gas?

In respect to the first question, I assume, as a matter of course, that the needful corrections were made, because a gentleman of Mr. Reid's experience and capacity is not likely to neglect so important a matter; but in respect to the second and third questions, I feel by no means certain, for as regards the bromine test and durability test, at all events, it has not been customary, as far as my experience in the South goes, to correct for atmospheric conditions. The fourth question

may be of little import; but I put it because I am by no means sure that specific gravity may not be an important factor when taken in connection with the condensation and durability tests.

It has, I think, been pretty well established that the photometric value of gas is not so much dependent upon the per centage volume present of hydrocarbons condensable by bromine as upon the character or composition of those hydrocarbons. Hence we may naturally expect to find great apparent discrepancies between the indications afforded by the bromine test and those afforded by the Bunsen photometer. Such discrepancies belong to experiences of a good many years gone by, when Mr. F. J. Evans, in the tables he published, showed that there was but little value to be attached generally to the indications of the bromine test, unless the density, as well as the per centage volume, of the condensable hydrocarbons were ascertained.

I abstain from any attempt to analyze the results given by Mr. Reid, first, because I have not time just now to spare; and, secondly, and more importantly, I have no desire to anticipate the production of a good paper by some one else on the important subject in question. I cannot, however, help saying that I am gratified to find that the results obtained with the Bunsen photometer are, to say the least, fairly consistent among themselves. This seems to indicate that our old servant, the sperm candle, is not such a bad fellow after all, if properly treated. He may not be very scientific, but, anyhow, he is useful.

F. W. HARTLEY.

55, Millbank Street, London, S.W., April 12, 1878.

SIR,—The subject of Mr. Reid's letter, published in your last issue, is one of considerable interest to all gas manufacturers, and it is to be hoped may be thoroughly investigated by the members of the North British Association of Gas Managers.

I have myself given the matter some little attention, in the expectation of being able, at no distant date, to make known the results of my experiments; but, failing just now the requisite leisure for them, I may just suggest to Mr. Reid, and to others who may be interested in the inquiry, that one of the conditions essential for the obtaining of uniform and comparable results, is equality of temperature of condensation.

Birmingham, April 12, 1878.

CHARLES HUNT.

SIR,—The table given by Mr. John Reid, in his letter in your JOURNAL of the 9th inst., is simple and honest, but it appears to me to indicate a defective course of analysis. I am sorry your correspondent has not given the weight of each sample per cubic foot, that being the first step which often inspires confidence, when the bromine and duration tests give conflicting results against the photometer.

I am not astonished at the Gas Engineers in Scotland looking out for something better than bromine and height-of-flame as definite tests; I hope, when they have decided on something better, it will not be a looking-at test. They may obtain results by weight, which will prove how useless these tests are, and prompt them to abandon the enormous waste of unfixed hydrocarbons caused by the use of gas from cannel only. Every practical experimenter must admit that the small volume of gas collected over water in the Cooper's tube, acted upon by bromine, absorbed by potassic hydrate, collected and estimated at the same temperature, is a very doubtful experiment, because the volume in the tube under atmospheric changes alters in composition from equal distillates of coal.

The same applies to the height-of-flame test, and if Mr. John Reid will try the following experiment, it will satisfy him of the uncertain results. Suppose, with the barometer at 30", and the thermometer at 60°, two U-tubes, 6 inches long,  $\frac{1}{2}$ -inch bore, and fitted with perforated rubber corks, with  $\frac{1}{2}$ -inch glass tubes bent at right angles, fixed tight in each arm, and each weighed filled, the first with granulated calcic chloride, and the second with granulated potassic hydrate. Connect them together in the order mentioned, and measure, per meter, through them a cubic foot of the gas. Re-weigh each tube, and note the *plus* weight. Repeat the experiment when the barometer is at 29", and thermometer at 70°, also note the weight. Then ask yourself what effect has the water in the gas and in the atmosphere upon the volume of gas in the Cooper's tube, and upon the volume of gas required to give the height of flame, and how such an atmosphere acts upon it. If Mr. Reid will then weigh the other three U-tubes together, three and four with washed dried coke saturated with standard Nordhausen sulphuric acid, and the fifth tube with granulated potassic hydrate, and pass half a cubic foot through the five U-tubes during three-quarters of an hour, he will then have the exact weight of water vapour, carbonic acid, and unfixed hydrocarbons, in grains per cubic foot.

There is not a more useful instrument in the experiment-room than Schilling's specific test for estimating the exact weight of one cubic foot of gas from any sample of coal distilled. This knowledge, acquired as a first step, will inspire confidence in the practical course which I have described.

I can obtain the true value of coal and gas by the volume, and the weight of unfixed hydrocarbons in that volume, at a given temperature, without the aid of the bromine or duration tests. The photometer is the standard; but your readers would be rather amused at the Referees with the weight of hydrocarbons required to give 16 candles, estimated by their newest standard burner, and the weight required to give 16 candles estimated by the old standard. The difference will prove the necessity of the volume and weight test described above.

April 13, 1878.

W. L., P. B.

#### OFFICIAL METER INSPECTORS.

SIR,—Permit me to call the attention of Gas Engineers, Managers, and Local Authorities to the careless manner in which Official Meter Inspectors frequently carry out their duties. Having constantly to come in contact with them, I find that in one town I can get a meter stamped which I cannot get stamped in another. Surely there is some gross mismanagement in one of those towns, or an excess of duty in the other.

I find by the 12th clause of the "Sales of Gas Act" it is enacted that no meter shall be stamped which shall be found by the Inspector to



register, or be capable of being made, by any contrivance for that purpose, or by increase or by decrease of the water in such meter to register quantities varying from the standard more than 2 per cent. fast and 3 per cent. slow.

Now, my experience in the matter is that many of the Inspectors test wet meters for per centage fast, and never test for per centage slow. Hence we find such meters repaired in a town where there is a Meter Inspector's Office are generally sent to another town to be tested and stamped, giving such repairers or makers an undue advantage over parties wishing to carry out the provisions of the Act.

I wish to know if any of your readers can give the information whether Inspectors failing to carry out the provisions of the Act are not liable to a penalty.

"METER."

#### HYDRAULIC LIFTS FOR PURIFIER COVERS.

SIR,—I observe, in your JOURNAL of the 2nd inst., a letter from Mr. Wyatt, calling attention to the fact that the apparatus now being erected at Beckton is "merely an extension of the same ideas" as those applied to the existing round purifiers, 41 feet 6 inches diameter. This would have been made perfectly clear if the paragraph (which appeared in your issue of the 26th ult.) had explained the difference between the two systems, which amounts to this: The cylinders of round purifiers are supplied, and the covers lifted, with pressure obtained from a hand-pump—rather a slow process as compared with the accumulator, combined with the valve and lever arrangement (adopted by Messrs. Abbot and Co., in consultation with Mr. Wyatt), for lifting the 16 new purifiers, 30 feet square. It is also proposed to introduce a simple arrangement to make the covers self-acting, and cut off pressure when lifted to the required height. When the covers are lowered, the water is exhausted back into the tank to be re-used. The accumulator, which is similar to those about to be erected at each end of the pier, by the same firm, for working all the hydraulic cranes for discharging coals, but very much smaller, will have sufficient power to work another set, if necessary.

It is, perhaps, a matter of some surprise that so few Gas Engineers and Managers have hitherto (even on works where the pressure exists) availed themselves of an application so simple and inexpensive as the ordinary hydraulic ram and cylinder, applied either internally or externally.

2, Suffolk Lane, Cannon Street, April 8, 1878.

J. COATES.

SIR,—I observe a letter in the JOURNAL of the 2nd of April, by Mr. Wyatt, claiming his priority to some one else in the application of hydraulic (hydrostatic) pressure for lifting purifier covers.

You published some years ago a diagram and description of a simple apparatus for this purpose, as designed and adopted by me in 1870. The matter is really not worth contending about, but as it appears to be in dispute, it is perhaps right that no mistake should exist as to the date of my adoption of the hydrostatic pressure lift for purifier covers. I enclose herewith, for reference, a copy of the original printed specification of such apparatus, dated 1870, wherein you will find it minutely described, and it was so carried out by Messrs. Hanna, Donald, and Wilson, of Paisley, for the Edinburgh and Leith Gas Company immediately after.

I shall in no way feel disappointed if it can be satisfactorily shown by Mr. Wyatt, or any other person, that I had been anticipated by any prior application of hydrostatic pressure to the purpose referred to.

Edinburgh, April 6, 1878.

JOHN REID.

DEATH OF MR. THOMAS BUSH.—We regret to have to announce the death of this gentleman, which took place yesterday morning at his residence, at Dalston. Mr. Bush was 63 years of age, and at the time of his retirement had been upwards of 40 years in the service of the Chartered Gas Company. For a long period he filled the important office of Accountant to the Company, and by the ability and assiduity he brought to the performance of his duties, commanded the respect and confidence of his Directors. The present Governor of the Company (the Hon. Howe Browne), in proposing a retiring allowance for Mr. Bush, when, in 1873, his health had succumbed to his zealous devotion to duty, spoke of him as one of the most valuable servants that any Company could possess. "He was a man," he said, "of thorough integrity, of great intelligence, and practical knowledge in his department, and one who could be depended upon to the very last figure. He was a man, too, who was constantly at work. So sedulously, indeed, did he apply himself to the labours of his office that he considerably impaired his health, and the extra work put upon him during the time of the late revision completely enfeebled him, so that he was obliged to send in his resignation." A handsome superannuation allowance was cordially voted to Mr. Bush by the Shareholders of the Company, and he retired into private life, carrying with him the sincere esteem of all with whom, during a long and honourable career, he had in any way come in contact. He leaves behind him two sons, both in the service of the Company, whose grief in their present bereavement will find some solace in the many assurances they will receive of the general regard in which their father was held.

QUALITY OF BIRMINGHAM GAS.—Mr. Jackson reports that, during the month of March, at the four gas-making stations of the Corporation, he made 16 examinations of the illuminating power of the gas supplied to the borough. The maximum light in sperm candles was 17.82; minimum, 16.26; average, 17.15. The parliamentary standard is 15 candles, with Sugg's No. 1 "London" burner.

ABERDEEN GAS COMPANY.—The annual meeting of the Shareholders of this Company was held on the 28th ult.—Mr. Henry Lewis in the chair. In moving the adoption of the report of the Directors, the Chairman congratulated the Shareholders upon the prosperous condition of the Company, which was most satisfactory, considering the very depressed state of the trade of the district. The success of the Company, he had no hesitation in saying, was mainly due to the exertions of their Secretary and Manager, who had so ably manipulated the affairs of the Company since their formation. It was scarcely necessary for him to state that no advance in the price of gas was made during the period of the coal famine, and since that time a reduction had been effected. The history of the Company seemed to be one round of success, as they were now on the eve of making another reduction in the charge for gas, and he hoped their prosperity would not suffer thereby. The report was adopted, and retiring Directors re-elected. The usual dividends were then paid, and votes of thanks passed to the Directors, the Chairman, and Mr. W. White, the Secretary and Manager.

## Parliamentary Intelligence.

### HOUSE OF LORDS.

MONDAY, APRIL 8.

The Examiners reported that no further Standing Orders are applicable to the Shrewsbury Gas and Dalton-in-Furness Local Board Bills.

Truro Water Bill,—brought from the Commons, read the first time, and referred to the Examiners.

Torquay Gas Bill,—read a second time, and committed.

TUESDAY, APRIL 9.

The Examiners reported that the further Standing Orders applicable to the East Grinstead Gas and Water Bill have been complied with; and that no further Standing Orders are applicable to the South Hants Water Bill.

Leicester Corporation Bill,—reported, with amendments.

Bradford Water and Improvement Bill, Nottingham Improvement (Gas, &c.) Bill,—brought from the Commons, read the first time, and referred to the Examiners.

Imperial Continental Gas Association Bill,—returned from the Commons, agreed to, with an amendment, which was considered and agreed to.

Durham Water Bill,—read a second time, and committed.

Farnworth and Kearsley Gas Bill,—read the third time, and passed.

THURSDAY, APRIL 11.

The Examiners reported that no further Standing Orders are applicable to the Cockermonth and Workington Water and Nottingham Water Bills.

Tredeggar Water and Gas Bill,—brought from the Commons, read the first time, and referred to the Examiners.

Torquay Gas Bill,—reported, without amendment.

Lichfield Gas Bill,—reported, with amendments.

Shrewsbury Gas Bill,—read a second time, and committed.

Petitions against the Bradford Water and Improvement Bill were presented from the Local Boards of Birstal, Clayton, Cleckheaton, Eccleshill, Heaton, Hunsworth, North Bierley, and Windhill, and the Calverley District Water-Works Company.

FRIDAY, APRIL 12.

The Examiners reported that no further Standing Orders are applicable to the Truro Water Bill.

Newry Gas Bill, Marske and Saltburn Gas Bill,—reported, with amendments.

Shrewsbury Gas Bill,—reported, without amendment.

Dalton-in-Furness Local Board Bill, East Grinstead Gas and Water Bill, South Hants Water Bill,—read a second time, and committed.

Leicester Corporation Bill, Torquay Gas Bill, Warrington Water Bill,—read the third time, and passed.

Lea Bridge District Gas Bill, Limerick Corporation Gas Bill, West Houghton Local Board Bill,—brought from the Commons, read the first time, and referred to the Examiners.

A petition against the Nottingham Water Bill was presented from the Corporation of Nottingham.

### HOUSE OF COMMONS.

MONDAY, APRIL 8.

The Examiners reported that no Standing Orders not previously inquired into are applicable in the case of the York United Gas Bill (Lords).

Bradford Water and Improvement Bill, Nottingham Improvement (Gas, &c.) Bill,—read the third time, and passed.

Dublin Corporation Water-Works Acts Amendment Bill (Lords)—read the third time, and passed, without amendment.

Imperial Continental Gas Association Bill (Lords)—read the third time, and passed, with an amendment.

Lea Bridge District Gas Bill, Limerick Corporation Gas Bill,—as amended, considered; to be read the third time.

West Houghton Local Board Bill,—as amended, considered; amendments made; to be read the third time.

Public Health Act (1875) Amendment (recommitted) Bill,—considered in Committee of the whole House; Committee report progress; to sit again.

Stoke-upon-Trent Corporation Bill,—reported.

Manchester Corporation Water Bill,—specially reported from the Select Committee, with amendments. [This report will be found in another column.]

A petition against the Hamilton Burgh Bill (the petitioners not praying to be heard) was presented from owners and occupiers of land and houses within the burgh of Hamilton.

TUESDAY, APRIL 9.

The Examiners reported that no Standing Orders not previously inquired into are applicable in the case of the Burton-upon-Trent Commissioners Bill (Lords).

Batley Corporation Water Bill (Lords)—reported, without amendment.

Maryport Improvement Bill,—reported.

Tredeggar Water and Gas Bill,—read the third time, and passed.

A petition against the Metropolis Water Supply Bill, and for dispensing with Standing Order 129 in the case of the said petition, was presented from James Stuart Strange.

The petition was withdrawn of Bent Colliery Company, Limited, and others against the Hamilton Burgh Bill.

#### METROPOLIS WATER-WORKS (PURCHASE) BILL.

The adjourned debate on amendment on second reading of this Bill was further adjourned to Monday, May 6.

Colonel BERESFORD gave notice that he would move to leave out the words printed in italics in the following notice of motion standing in the name of Sir James M'Garel-Hogg:—"After second reading of Metropolis Water-Works (Purchase) Bill, to move—That it be referred, together with the Metropolis Water Supply Bill, to a Select Committee, four to be nominated by the House, and three by the Committee of Selection. Five to be the quorum."

WEDNESDAY, APRIL 10.

Cardiff Water Bill, Newbury Borough Extension Bill,—as amended, considered; to be read the third time.

The *locus standi* of John Clayton and others against the Bedlington Local Board Water Bill (Lords) was disallowed.

THURSDAY, APRIL 11.

Lea Bridge District Gas Bill, Limerick Corporation Gas Bill, West Houghton Local Board Bill,—read the third time, and passed.

The Examiners reported that the Standing Orders not previously inquired into, and which are applicable thereto, have been complied with in the case of the Castleford and Whitwood Gas, and Sutton-in-Ashfield Gas Bills (Lords).

Hamilton Burgh Bill,—reported.



FRIDAY, APRIL 12.

The Examiners reported that the Standing Orders not previously inquired into have been complied with in the case of the Clitheroe Gas, Water, and Improvement and the Normanton Gas Bills (Lords).

Batley Corporation Water Bill (Lords),—read the third time, and passed.

East Retford Borough Bill, Weston-super-Mare Improvement Commissioners Bill,—reported.

MONDAY, APRIL 15.

## METROPOLIS WATER SUPPLY.

Mr. FAWCETT asked the Secretary of State for the Home Department if he would consent to the appointment of a Select Committee to inquire whether the Water Supply of London should continue to be in the hands of private Companies; and, if not, to what public body it should be entrusted, and on what terms the rights of the existing private Companies should be acquired.

Mr. SCLATER-BODD: With the permission of the House, I will answer the question put to my right honourable friend the Home Secretary. The existing Metropolitan Water Supply was a subject of careful inquiry by a Select Committee of this House, and there was also a Select Committee which sat last year on the subject of the supply of water to the Metropolis with the view of extinguishing fires in London. The Government, as at present advised, are of opinion that no case has been made out which would justify the appointment of a Select Committee to inquire into the subject to which the honourable gentleman refers. With regard to the second part of the question, whether the Water Supply shall continue to be in the hands of private Companies, there are ample materials at the disposal of the Government to form an opinion when the time arrives for legislation upon it.

## HOUSE OF COMMONS COMMITTEES.

MONDAY, APRIL 8.

(Before Dr. LYON PLAYFAIR, *Chairman*; Mr. SALT, Mr. RODWELL, Sir UGHTRED KAY-SHUTTLEWORTH, Mr. KNOWLES, Lord ESINGTON, Mr. BRASSEY, Sir JOHN LUBBOCK, and Mr. BRUCE.)

## MANCHESTER CORPORATION WATER BILL.—REPORT.

The Select Committee to whom the Manchester Corporation Water Bill was referred, and who were instructed—"That they have power to inquire into and report upon the present sufficiency of the water supply of Manchester and its neighbourhood, and of any other sources available for such supply; to consider whether permission should be given to make use of any of the Westmoreland and Cumberland Lakes for the purpose, and, if so, how far, and under what conditions; to consider the prospective requirements of the populations situated between the Lake District and Manchester; to inquire and report whether any, and, if so, what provisions should be made in limitation of proposals for the exclusive use of the water of any of the said lakes"—have considered the matters to them referred, and have agreed to the following report:—

Your Committee on the Manchester Corporation Water Bill have had 19 sittings, and heard counsel in support of the Bill, and also in opposition to its preamble and clauses.

Your Committee proceed to report in the order of the references contained in the instruction.

Manchester is at present bound to supply water to districts beyond the city, and the population within this statutory area of supply is now estimated at nearly a million. When certain reservoirs, now in course of construction, are completed, the present available supply from the Longendale gathering-ground will not be far from 25 million gallons daily per head of the population within the area.

Your Committee assume that 25 gallons per head form a fair supply for a district, and hence Manchester has at present a sufficient quantity of water for the city, and its statutory area of supply. But the population is rapidly increasing. The houses, within the inner district, supplied with water in detail, increase in number 5300 annually, and in the outer district, supplied in bulk, by 2200. Calculating five people to a house, in ten years more there may be a population of 1,337,000, with a water supply only sufficient for 1,000,000. Considering that a period of ten years is not a very long time to bring a new system of water supply to a large district into efficient operation, your Committee came to the conclusion that Manchester is justified in seeking for additional sources of supply. The question still remained whether it could not obtain this supply in its own vicinity, without going to the Lake District of Cumberland.

All the water which falls as rain upon the hills of the present gathering-ground is not impounded, but the difficulties of a further collection are so great that your Committee were satisfied it would be unwise to calculate upon any large additional supply from the present district. There are many other good gathering-grounds for water in Lancashire, but they are either appropriated by existing towns, or they are so advantageously situated for the natural growth of the population in their neighbourhood, that it would be unjust to a thriving manufacturing county like Lancashire to grant to Manchester the right of carrying away the water from other populous regions for its own use. Your Committee had the advantage of a previous consideration of the general subject of water supply in the report of the Duke of Richmond's Commission, 1868-9, and they draw attention to the following extract, in which they fully agree: "It appears to us that the Legislature should always jealously watch any proposal for a town taking water from a gathering-ground at a distance from it, lest by so doing it may deprive other places nearer to such gathering-ground of their more natural source of supply" (p. 124). Suggestions were made to the Committee, that water might be obtained from the Derwent Valley in Derbyshire, on the other side of the watershed, by driving a long tunnel through the hills; but the costly character of this operation, in support of which only slight evidence was adduced, rendered it unnecessary for the Committee to take it into serious consideration as an alternative scheme.

The opponents of the Bill admitted that, if an important city like Manchester needed a supply of water, and could not obtain it from its own neighbourhood, there was an ample justification for it seeking a supply from the Lake District, although it is 100 miles distant.

This brings your Committee to the next reference in the instruction—viz., to consider whether permission should be granted to the Manchester Corporation to take water from the lakes of Cumberland and Westmoreland. The valleys of the Lake District radiate from Scaw Fell, and are bounded by a series of mountains of slate and primitive rock, from 2000 to 3000 feet in height. The Irish Channel is distant about 15 miles from them, while the south-westerly winds of the Atlantic, laden with moisture, become chilled in mounting over this barrier, and precipitate rain in extraordinary quantity, sometimes amounting to 4 or 5 inches in a few hours. In the hills near Thirlmere the rainfall is about 100 inches annually. As the mountain barriers of this district form the chief natural condensers for the large amount of water which the currents of wind from the Atlantic bring to this island, it is a matter of public interest how far the water thus condensed can be used for the general public

benefit. But the public at large have also an inheritance in the beautiful scenery of these mountains and lakes. The abstraction of water for public purposes should, therefore, be made subject to conditions which will confer its use without injuring the natural beauties of the lakes and their surrounding mountains. There are only three lakes—Ullswater, Haweswater, and Thirlmere—at sufficient elevation to supply Manchester by gravitation. The cost of making tunnels from the two first, both from their length and depth below the surface, renders them less suitable for the purpose. Lake Thirlmere, in Cumberland, possesses great natural beauty, and has a scant population in its vicinity. The hills which supply it with water are, practically, free from mines and other sources of contamination, while the quality of the water is excellent. The Corporation have bought the surrounding hills, so as to preserve the gathering-ground from contamination, either from houses or mines. Their natural state will thus be preserved for future generations. Undoubtedly, Lake Thirlmere possesses many advantages as a source of water supply for a large district, if a portion of the water could be removed without destroying the beauty of a scenery which is a valued possession of the whole nation. Upon this subject much evidence was adduced. The lake is formed by a natural dam of rock at its south end, and this causes the valley to be filled by the drainage from the hills. In former times the lake was much larger than it is at present, but parts of the rocky barrier being worn away, the lake became reduced to its present dimensions. The proposal of the Corporation is to fill up the parts thus abraded by an artificial embankment, and thus to restore the lake to its ancient condition. This is an engineering work of great simplicity, for the highest portion of the embankment will only be 50 feet, and, in proportion to the lofty hills around, it is not of a character to attract attention. The water thus impounded will rise 50 feet, and cover a greater area of ground. It will remove the narrow portion of the lake which is now crossed by bridges in the middle, and will thus certainly obliterate a characteristic feature in it. On the other hand, though one small island will be submerged, two new islands will be formed, so that these may partly compensate for the widening of the narrow part of the lake by breaking up the continuity of the surface. Mr. W. Brodrick Thomas, who has large experience as a landscape gardener, expressed a positive opinion that the enlarged lake would enhance the beauty of the scenery. Undoubtedly, if the roads are constructed as projected in the Bill, the lake will be seen in future by a much larger number of people than at present, for the Proprietors hitherto have kept it very much like a preserve, and have offered few facilities for the enjoyment of the scenery by the general public.

The Corporation of Manchester are limited, by their proposed works, to abstract 50 millions of gallons a day at any future time. For many years this maximum quantity cannot be required. At first only 10 millions of gallons will be taken. With this supply, in a continuous drought of 70 days (a period in that rainy region of exceptional occurrence), the lake would only be lowered 4 feet. With the maximum supply of 50 millions of gallons, a period of 70 days drought would lower the lake 20 feet, and it would require no less than 160 days without rain to reduce the level of the lake to its present condition, even with the maximum abstraction of water. Practically, therefore, the removal of water, even in dry weather, is not likely to exercise any material alteration in the general appearance of the lake. The fluctuation in depth of the existing lake, between high and low water, is between 8 and 9 feet, and such an extent of change is not likely to occur under the new conditions, unless under exceptional droughts of continued severity. As the margin of the lake consists of shingle and not of mud, the temporary alterations in the level will be unimportant.

Your Committee, satisfied that the water of Lake Thirlmere could be used without detriment to the public enjoyment of the Lake District, proceeded to examine the means for carrying the water to Manchester. This is to be effected by a composite aqueduct of 102 miles in length, partly consisting of 14 miles of tunnels, partly of 39 miles of a "cut and cover" channel in the ground, and partly, in the case of valleys and rivers, by 33 miles of cast-iron syphon pipes, or, in a few cases, by bridges. Your Committee, before passing the preamble, took ample precautions, not only that the landowners in the Lake District, but also that the general public, should be protected from the works being executed in such a manner as might deface the natural beauty of the scenery, for the clauses now introduced give both the landowners and the public the right to lay complaints before Her Majesty's First Commissioner of Public Works. Your Committee, having carefully provided for these interests, are satisfied that, beyond the temporary inconvenience and unsightliness caused by the construction of the works, there will be little or no permanent injury to the scenery. The tunnels, which are 7 feet in diameter, are likely to be the chief and longest source of inconvenience, but evidence was given that the modern use of machinery for driving tunnels, instead of hand labour, will much shorten the time for their construction as compared with former works of this kind.

Your Committee were further instructed to consider how far the prospective requirements of the populations situated between the Lake Districts and Manchester should be consulted before authority was given to the Corporation to supply itself with water from Lake Thirlmere. Various important towns and rural districts, including Walton-le-Dale, Wigan, Hindley, Leigh, Oldham, and Hyde, actually applied to be supplied with water from the Manchester Corporation in the event of this scheme being carried out. The Duke of Richmond's Commission had already recommended, in their general report on water supply, "That when any town or district is supplied by a line or conduit from a distance, provision ought to be made for the supply of all places along such line."

Considering, however, that Manchester supplies the capital and executes the proposed works, your Committee deemed that its district of supply had a prior right to 25 gallons of water per head of the population, as it increases, from all its sources of supply. Subject to this prior use, your Committee introduced a clause giving to Corporations, Urban and Rural Sanitary Authorities, throughout the line of conduits, and in their neighbourhood, a right to require a supply not exceeding 25 gallons per head of the population then existing, if the Local Government Board deemed their demand to be reasonable. The cost of supply might be made a matter of agreement; but, if no agreement were made, then the cost was to be at the rate of 4½ per cent. on the proportion of the capital expended to produce the supply demanded, and a like proportion of an annual sum of £20,000 to enable the works to be maintained and managed. Practically, these two sums, added together, do not differ widely from the basis of a 5 per cent. charge on the whole capital when the works are completed for a full supply.

Your Committee having carefully inquired into the premises in accordance with their instructions, now present this as their Special Report.

The Select Committee further report, that a report from the Local Government Board has been laid before the Committee, and considered by them, and that they have adopted such of the recommendations therein contained as appeared to them applicable to the circumstances of the case submitted to them. That with respect to Standing Orders Nos. 185 and 186, the compulsory powers of the Bill extend over more than



15 houses occupied by persons belonging to the labouring classes, and the Committee have inserted a clause in the Bill requiring the promoters to procure sufficient accommodation for such persons before exercising the said powers. And that they have examined the allegations contained in the preamble of the Bill, and amended the same by inserting a recital as to the supply of water in bulk by the Corporation to certain Local Authorities, and found the same, as amended, to be true; and have gone through the Bill, and made amendments thereunto.

THURSDAY, MARCH 7.

Before Sir LAWRENCE PALK, *Chairman*; the Marquis of LORNE, Mr. STARKEY, and Mr. ERNEST NOEL; Sir JOHN DUCKWORTH, *Referee*.)

CHELtenham WATER BILL.  
CHELTENHAM CORPORATION WATER BILL.

(Continued from p. 555.)

[Sir Lawrence Palk being absent, from indisposition, the Marquis of Lorne took the chair during the remainder of the inquiry.]

Mr. Thomas Hawksley, C.E., examined by Mr. VENABLES.

I have paid particular attention to the case of the water supply of Cheltenham. In 1845, I was engaged on the sand-bed question. A considerable portion of the town is placed on a sand-bed, which is charged with water, and for many years the opinion of the town—though, of course, a perfectly erroneous one—was that this was the most precious of all kinds of water. I thought at that time that the sand-bed afforded a very indifferent supply, and must necessarily go ultimately out of use. Cheltenham is placed upon the lias, which is of waterless formation; the lias is in places scooped out, and those places have been filled up with sand in basins. That sand contains a certain quantity of water, derived chiefly from rainfall, but partly by percolation from the neighbouring streams. Where the clay comes to the surface there is practically no water. There are no springs in the neighbourhood of any magnitude that are not taken up. There are small springs on the line of the river Chelt, but they are perfectly insignificant for the purposes of a town supply. The Company have, in fact, picked out for their own supply all the useful and available springs. There are two very beautiful springs on the Cotswolds, which would be perfectly available for the supply of Cheltenham if they could be obtained, but they cannot be. Every effort made to obtain them by means of works or by means of money has failed. The opposition of the estate owners for miles is so determined, and so powerful, that it is impossible to overcome it. Besides, these springs are the two heads of the Thames, and Parliament have a distinct objection to the sources of the Thames being tapped for the supply of any place within the watershed of the Severn. Not being able to obtain these springs, I some years ago traversed the whole line of escarpment and the watershed, for the purpose of discovering available sources, and I was not then able to discover any. The sources of the Chelt would, of course, receive the first attention, but the quality of the springs would be the same as that of the present supply, while the surface drainage would be very inferior. The gathering-ground there is very unsuitable. It, to a considerable extent, consists of lias clay, and I never knew a good water produced from the lias. Where the lias does not come to the surface, which it does over a considerable part of the valley, there is the oolite, and these springs come from the rainfall of the oolite. The smallness of their volume is partly to be accounted for by the fact that the strata over a considerable part of the surface declines towards the Thames Valley, and it is only when the strata are loaded with water that the water oozes over on the higher level, and forms the more copious part of the springs, which descend into the Chelt Valley. The supply to be obtained from the springs and the sources of the Chelt would go down in summer to less than 100,000 gallons a day. Although this has been a wet winter, the spring at the head of the Chelt was the other day yielding only about 30 gallons a minute, or 40,000 to 50,000 gallons a day—a perfectly insignificant quantity. The Corporation propose by their Bill to send 100,000 gallons as a minimum down the Chelt every day. That would, of course, have to be provided before any water could be taken for supply. I could never have proposed a scheme in a valley like that without proposing the usual *quantum* of compensation—viz., one-third. It is not the same thing to give compensation in money and compensation in water; in some places money will satisfy the interests, and in others it will not. I never could make out that we should get so much by the utilization of the whole valley as something between 300,000 and 400,000 gallons a day, which is, when we are coming to Parliament for a competent scheme, an insignificant *quantum*, even when added to what we have got. The whole quantity, deducting water for compensation, would be about 600,000 gallons a day. Taking the population at 60,000, that would give ten gallons per head per diem. This allows nothing for future increase or extension of limits. I should object altogether to supplement the spring water by water from the drainage area in the neighbourhood; but I am not, in that calculation, estimating the capability of the springs only. I am taking the whole drainage area, combined with such storage as the valley affords. Taken by itself, the drainage area would give more water, upon an average of three ordinary dry years, than the quantity I have mentioned; but there is no place to put it in. You cannot calculate altogether from that drainage area on more than about 7½ inches of rainfall, of which only a very small part can be collected, because the valley does not afford good situations for competent reservoirs. In that neighbourhood it is absolutely necessary to provide a storage for 250 days. At Leicester, where the rainfall was exactly the same in 1868, 244 days supply was taken from the reservoir before it began to refill. What has to be done is this: The contents of the reservoir must be divided by 250 days, and taking the contents of a reservoir, such as could be made on the Chelt at 100 million gallons—that divided by 250 would give 400,000 gallons a day—out of which compensation must be given. The Leicester reservoir, holding 340 million gallons, was emptied in 240 days. About 300,000 gallons a day is all you could rely on for town supply from the gathering-ground of the Chelt Valley. One objection to this gathering-ground is that it is grass land for the most part, and is necessarily manured to a considerable extent with town manure, which is not a desirable thing. The locality is not favourable, as affording sites for reservoirs. The ground is traversed by a high road, which runs through nearly the middle of the valley from Cheltenham to Oxford, and by a railway now in course of construction, so that it has become necessary to form what can be made of a reservoir by putting an embankment across the stream, and then running it for a great distance on the side of the road. As a matter of course, a reservoir formed in that way not only holds very little water, but is also disproportionately expensive; and, being upon unsafe ground, is necessarily dangerous to the town which is situated immediately below it.

Mr. BIDDER objected to this evidence, as no such point was raised in the Company's petition.

The CHAIRMAN said they might go generally into the matter of the possibility of getting a sufficient supply in the neighbourhood, without going into the details of the scheme.

Witness: The result of twelve years consideration was that I could not recommend the Chelt Valley to the Company. It was not a proper place to resort to, and I advised the adoption of the River Severn. The Direc-

tors agreed with me, and the result is, so far as the Company are concerned, the project now submitted to the consideration of the Committee. I was concerned in the various parliamentary proceedings which took place with a view of introducing the Severn water. The opposition in those cases was principally directed to the quality of the water. The result was that while, for the time being, it induced the Company to abandon the Severn for the supply of Cheltenham, they adopted it for the supply of Tewkesbury; and having been able to demonstrate, by means of that supply, the excellent quality of the Severn water, they are now before Parliament under different circumstances to what they were at that time. They were then poor, but are now rich.

Mr. BAZALGETTE: As a matter of fact, did the Referees in 1865, having the Severn water specially submitted to their consideration, report "The Referees are of opinion that there are no sufficient objections to the proposed source of supply and the quality of the water"?

Witness: They did; and the preamble of the Bill was passed by the House of Commons. The result of that inquiry was to introduce the Severn supply to the town of Tewkesbury.

Mr. BAZALGETTE: I presume I may take it, before you advised the introduction of the Severn water, you satisfied yourself as to its quality?

Witness: I did. I had known the Severn for many years previously; I have been engaged upon engineering matters connected with that river from about the year 1844. I have here samples of the ordinary water supplied to Tewkesbury. It is a very excellent water, suitable for the supply of any large community. It is good for all purposes. It is a clear, bright, wholesome, and palatable water, good for domestic, for manufacturing, and for general purposes. The same water practically is supplied to Worcester; but it is somewhat improved in our case by the introduction of the Teme. The Teme drains more than 700 square miles—a very beautiful drainage-ground. I am intimately acquainted with the Teme. Any sewage passing from Worcester would get the full benefit at once of the influx of the Teme. We are dealing with an enormous river; we have 2700 square miles of drainage coming down to the works at Tewkesbury, and the population is so sparse that there are three acres of land to every individual. I admit it is not a desirable thing to have sewage introduced into any stream; nor will it be introduced for long, for the Rivers Pollution Act, which only came into operation a few months ago, contains provisions very easy to put in force, which will have the effect of making the towns either keep their sewage out of the river or purify it before it is put into it. At the same time, allow me to mention that the introduction of that small quantity of sewage into so large a volume of water, charged with oxygen as all these waters are, cannot by possibility continue to be sewage, even for a couple of miles. It is all burned out by the oxygen in the water, and utterly destroyed. The constituents of all the foulest things on earth are as pure when separated as in their normal condition; it is only the association, and the relative proportions in which they are associated, that give them a particular form, but the moment they are dissociated they are as pure as ever they were.

The whole volume of the river is charged with air, in fact?—There is air, undoubtedly; but the sewage is in three times the quantity in which it exists in atmospheric air. The whole Atlantic would be one foul cesspool at the present moment if it were not for this spontaneous purifying power of our rivers.

Apart from the question of quality, is the Severn water capable of easy filtration?—It is remarkably easy to filter.

Having regard to the geology of the Severn watershed, is it favourable for obtaining good and untainted water?—Very so; a large portion of it consists of the silurian formation, and other parts chiefly of the new red sandstone. The river at Tewkesbury is not often affected by tidal water and it has never been found necessary to suspend pumping, though it would be easy to do so if the necessity arose. The fact is, the Severn is practically pure, whatever it may be sentimentally. What the Company propose to do, by their Bill, is to utilize all the existing works as they now stand, by means of the water which they will obtain in addition from the Severn. We propose to make our works in two sections; to commence by putting down engine power and filter-beds, and pipes for the raising and conveyance to Cheltenham of 1½ million gallons per diem, making our present resources 1½ millions per diem—that is, for the present population. Then, for a future population, in years to come, we propose to make the second half of the works for another 1½ millions, making 2½ millions out of the 3 millions, and leaving the remainder for Tewkesbury and other places in its neighbourhood. Our object, then, is to supply, on the line of the pipe which follows the public turnpike road from Tewkesbury to Cheltenham, all the villages upon the lias. Gloucester, also, is not well furnished with water at the present time, and will probably be very glad to take a supply in bulk. There will be no additional works at Hewletts, but there will be the necessary additional reservoir accommodation at Tewkesbury. The 1½ million gallons proposed to be taken at once will supply 25 gallons daily to each person, taking the population at 60,000; 20 gallons would be amply sufficient, but we provide 25. It is not a manufacturing town, and does not want large quantities of water. The usual seven or eight gallons for manufacturing purposes out of the 25 gallons are not required. The total cost of the works for supplying the 3 million gallons will be £112,000; but, being made in sections, the first outlay will be about £60,000, including the land for the whole. The scheme is simple, economical, and efficient, and I am prepared, if necessary, to give reasons for that opinion.

Cross-examined by Mr. BIDDER: The Company consulted me some time last autumn as to the best policy, with a view of meeting the Corporation Bill.

Mr. BIDDER: Did not you advise them that they had better get up a scheme of their own, or else they would not have a leg to stand on?

Witness: No.

Or to that effect?—Well, I may say to that effect, because, of course, they would not.

And did you not advise them, if they were to have any chance of opposing the Corporation Bill, they must get up some scheme of their own, and bring it to Parliament?—Certainly; that would be a natural part of the business; but I did not advise them to go to the Chelt. There was ample time to deposit plans. We did not avail ourselves of the old survey of 1865; every inch of the ground was surveyed again, and there is no part of the scheme the same as that of 1865. I should prefer spring water to river water, as being briske and more palatable, if it could be got.

Is it not the fact that there is a very general movement throughout the country, on the part of towns deriving their water supply from rivers, to leave the rivers and go to springs or subterranean sources of supply?—I cannot say there is. It is so in manufacturing districts. If you were to take the ideal and sentimental view of the case, which is taken by some professional chemists, then not 2 per cent. of the waters of any county would be available for the supply of the population.

You do not take the sentimental view?—No; I take the practical view. A hundred water-works cases of my own have taught me the nonsense of all that. The extreme dry weather flow of the Severn may be 90 million gallons per day. The Worcester sewage is about three-quarters of a million gallons a day.

If the sewage of Worcester is fairly mixed, the consumers of your water



will have 25,000 gallons of Worcester sewage every day?—Taking your mode of putting it, that would be the fact; but assuming my way of putting it—that it is not to be consumed—it would not be the fact.

It is there, but it is transformed in its character?—It is not transformed, it simply does not exist; but you know the worst of the sewage will be taken out, and so will the sewage of all these places.

I know your views, they are very peculiar views.—Peculiar?

I think I may summarize them thus—that you may take any sewage and mix it in a river in the proportion of something like 1 to 40 or 50, and if you only let it run down the river 20 miles you may drink as much of it as you like?—You may assume that, if by sewage you mean ordinary decomposed sewage.

Ordinary house sewage?—Undoubtedly.

Containing fecal matter, and so on?—You like to put it in an obnoxious way. That is the most decomposable of all effete matters. Although Cheltenham, as an inland watering-place, is of necessity dependent on the purity of its water, I do not think its reputation would be injured by the introduction of the Severn water, because it would be impossible for any one to know the difference. I am still of opinion that Sierford Spring is the best source of supply for Cheltenham, and that it ought to be brought to Cheltenham; but that, in view of the decision of Parliament, is out of the question. I may have said before the Committee, upon the proposed acquisition of the Sierford Spring, that the Severn water was not fit for domestic purposes, even if it could be got.

Then what has happened since to make it so?—The making of the weirs. The tide at that time ran up to Worcester, and the water washed backwards and forwards past Tewkesbury. The Avon water, which flowed into the Severn some eight or nine miles above Cheltenham was not a good water in 1854. Since then sewage works have been made at Coventry, Rugby, Leamington, and Warwick. But, apart from that, the Avon water is not a good water. It does not come off a good formation for water supply purposes. It is very hard water. The size of the main is 14 inches for each section. I do not know that soft water is better than hard water on sanitary grounds. As a matter of fact the hard water towns have about 14 per cent. less mortality than the soft water towns; but I am not disposed to attribute that entirely to the quality of the water. The different occupations of the people may in part account for it.

Dr. Charles Meymott Tidy, examined by Mr. MICHAEL.

I am a Batchelor of Medicine and Master in Surgery. I am Professor of Chemistry and Medical Jurisprudence in the London Hospital. I have had large experience in all matters connected with public health, and the supply of water to large communities. I have carefully examined the River Severn. The banks are exceedingly clean, with no black deposit, and there is nothing whatever to denote contamination by sewage. I have twice examined the course of the river between Worcester and Tewkesbury. The water at Tewkesbury is undoubtedly excellent. I took a series of samples at different spots. The general result was that, after a certain spot, about a mile below the junction of the Teme with the Severn, the water became very good. After the Worcester sewage flows in, the total solids, the chlorine, the organic carbon, and the nitrates increase, clearly due to the contamination of the sewage; but the water rapidly becomes purer and purer. There is a slight variability in the quality, which I account for by the existence of bottom springs. At Tewkesbury there was only .02 of a grain of ammonia per gallon, and 1.656 grains of chlorine. The hardness at the intake was 11° before boiling, and 6° after boiling. It is a moderately hard water, and excellent for general use. The organic carbon was .212 in 100,000 parts, and the organic nitrogen 0.018. Though the river receives some sewage at Worcester, it becomes oxidized by the time it reaches Tewkesbury, and is practically destroyed. I have given a very great deal of attention to the medical aspects of water supply, and as a medical man I say the water supplied from the river at Tewkesbury is a perfectly wholesome, pure water, and not the slightest danger need be expected from drinking it.

Cross-examined by Mr. POPE: I gave evidence in the Stockton case, in favour of the Tees water. I do not believe in sewage after it has flowed 18 miles.

Mr. POPE: But you have found it very difficult to persuade people, notwithstanding all the authority of chemists, that water is as good which has had sewage in it as water which has not?

Witness: A sentimental argument is always more difficult to meet than a truly chemical one.

Assuming that doctors of authority differ, how are the unfortunate individuals who have to drink the water to make up their minds?—Though the Rivers Pollution Commissioners would say that the water contains too much carbon, I beg to say that, besides the chemical aspect of the question there is the medical aspect, and, in my opinion, the report of the Commissioners was erroneous, looking at the subject from a medical point of view.

Apart altogether from medicine or chemistry, supposing there is a source of supply, open to a community, which is free from any such objection, should you be surprised at the sentimental feeling of the community that they would rather have it than sewage water?—But I do not admit this to be sewage water.

Water which contains double the quantity of organic carbon?—I do not think it makes the slightest difference in the world.

The comfort of the drinker would depend upon his faith in the water?—No. I would say the comfort of the drinker would greatly depend on experience.

Cross-examination continued: I never saw a disease germ in my life. When we hear so much about them I think it is only fair to ask that those who assert their existence so strongly as the actual cause of disease, and the means by which disease is spread, should at least give us some evidence of their existence. I am rather pained to hear people speak so positively as they do about things which they have never seen. I quite admit that water impregnated with sewage matter could produce disease. You say it is due to a germ; but it is perfectly clear that water that has had sewage in it is drunk by a large number of people without producing disease. My samples which gave the analysis I have mentioned were taken during the winter flow, on the 11th of January. It is not necessarily the case that during the summer, when the volume of water is less, whatever impurity there is would exist in larger proportion. It may be so, but I have never made an examination of the river in summer. You would expect it to be so, but you do not always get it. I do not know that the sewage of Worcester decreases during the summer; but whether it is the dry flow or the average flow, the dilution and oxidation are sufficient. I do not agree with the Rivers Pollution Commissioners when they say that there is no river in the United Kingdom long enough to effect the destruction of sewage by oxidation. As the result of an immense number of experiments, I really know that sewage does become oxidized. There is not a single fact in support of a possible danger arising from sewage after a long run. I am convinced that not a particle of organic matter that goes into the Severn at Worcester finds its way down to Tewkesbury.

Mr. POPE: Notwithstanding the strength of the opinion which you have consistently expressed, Parliament preferred to give Stockton a pure supply of water.

Witness: I cannot say in the least what was the reason that operated on

the Committee to take the view they did. They did not say it depended on the chemical evidence, and therefore you can scarcely assert that the reason Parliament took that view in that case was due to the fact of the sewage going into the water.

Re-examined by Mr. BAZALGETTE: At the intake, the water of the Severn is not simply good, it is excellent. The question is not what goes into the river at Worcester, it is what is the character of the water at Tewkesbury, and I give a positive opinion that it is as good and wholesome a drinking water from a chemical and medical point of view as it is possible to have. Neither I nor any other man has ever caught a disease germ. It cannot be detected by either microscopic or chemical analysis. I do not say there may not be some truth in the germ theory, but it is not even an hypothesis; it is simply an effort of the imagination. I did not hear the evidence as to the diminution in the number of cases of typhoid fever in Tewkesbury since the introduction of the Severn water, but I can quite believe it. Even if the rainfall were used, there would be some organic matter in it. The magnificent brilliancy of the water in the pure-water tank at Tewkesbury almost surpassed anything in the way of water I had ever before seen. The clearness which enables one to see from the top to the bottom is wonderful. Rainfall flowing into a stream would undoubtedly contain a certain amount of organic carbon. To my mind, a flood does not in any sense improve a river. Such a large quantity of water displaces a great deal of solid matter, but not to a sufficient extent to make the water dangerous. Of course, that would apply to small streams as well as to rivers.

Mr. BAZALGETTE: Take ordinary vegetation, which at certain seasons of the year undergoes decomposition, would that produce organic carbon?

Witness: Everything that contains carbon supplies carbon.

The presence of organic carbon, in a small quantity, does not necessarily denote the presence of sewage in the water?—Oh dear, no. The fact is, if you were to put a teaspoonful of turtle soup into a large reservoir, and were to test the water solely by the existence of organic carbon, you would return a report to the effect that that water was unfit to drink.

Mr. William Crookes, examined by Mr. BAZALGETTE.

I am a Fellow of the Royal Society, and Vice-President of the Chemical Society. I accompanied Dr. Tidy on the second occasion, when he went to take samples of this water on the 2nd of March, but not on the 11th of Jan. The results show that the water at the intake above Worcester, before the sewage falls into the river, is excellent. A little below the outfall of the Worcester sewage there is a sudden rise of constituents, which shows the presence of sewage matter. Below where the River Teme falls in there is a sudden drop in all the constituents—in the hardness, in the amount of chlorine, and in the total solids. I consider that that sudden drop is caused by the water of the Teme not having quite mixed with the water of the Severn. The water soon regains its normal quality. At one point there is a small influx of saline matters, which cannot be accounted for except by the existence of some bottom spring. This is a thing not at all unknown in that formation. It is well known that in the new red sandstone there are saline springs containing a large quantity of common salt. At the intake at Tewkesbury the organic nitrogen is very small, and the initial hardness about the same as the regular run of rivers. It is a tolerably soft water. The initial hardness of it is between 10° and 11°, and after boiling 2.3°. The amount of chlorine is not more than one would ordinarily expect in a river. There are 2.44 grains of salt in an imperial gallon; but in well water as much as 30 to 40 grains are frequently found. A great many rivers contain much more chlorine. It depends upon the formation they pass through. The amount of chlorine found there is no indication of the presence of sewage. The same cause which increases the amount of chlorine in the bottom spring also increases the amount of total solids, but they do not rise above 21.75 grains per gallon. The free and saline ammonia are nothing in this pure water. The nitrates and nitrites represent nitrogen reduced to an innocuous form. The water is most excellent in a sanitary point of view.

Cross-examined by Mr. POPE: The nitrates and nitrites are produced by the oxidation of nitrogenous matters. They might be the result of animal contamination. Probably that is so. I consider the amount of chlorine present is a much better test of previous sewage contamination. My analysis does not give the organic carbon, as the time required to carry out a proper analysis of the organic carbon was greater than has been allowed since the 2nd of March. On that date the river was in flood about 18 inches above the normal level, but it was not overflowing its banks.

Mr. POPE: Do you believe in disease germs?

Witness: I cannot say that I do. I like to have good evidence on a subject before I believe it.

But you know one is in the habit of looking to you as a great authority on things that are not seen?—Yes; but I require good evidence, and that I have not had in the case of disease germs. I have tried to form a mental picture of what a disease germ is, and I find great difficulty in doing so. At the same time, I can imagine the almost certain probability of sewage being rapidly oxidized by the oxygen in the water. It is well known that organic matter absorbed in water is rapidly oxidized.

Re-examined by Mr. BAZALGETTE: The experiment upon which Dr. Frankland based his assertion that no river in England is long enough to purify sewage was a laboratory one; but a laboratory experiment in a case like this is of no value whatever. Admitting the existence of disease germs, I do not see why they should be so entirely different from all other organic bodies that they should resist the powerful action of oxygen upon the water. As the water becomes purer the animalculæ die. They are, in a sense, the scavengers of the water, and by emitting oxygen they purify it, and virtually destroy themselves. The oxidation is caused partially by the absorption of the oxygen from the atmosphere, and partly by the oxygen given off by the plants in the water under the influence of light, and those two things are very difficult to imitate in a laboratory. I have tried hundreds of experiments on the oxidation of organic matter, and in all cases oxidation has taken place. Speaking as a practical chemist, I cannot see any fault in the water at the intake, regarded from a sanitary point of view. Water itself may be the product of oxidation of sewage matter. Part would be oxidized into water, part into carbonic acid, and part into nitrates and nitrites, and after the constituents are oxidized they are perfectly harmless.

The CHAIRMAN: Is it a very weedy river? Are there many water plants in it?

Witness: Not very many. The banks are very clean.

Professor D. T. Ansted, examined by Mr. BAZALGETTE.

I am a Fellow of the Royal Society, and for the last 30 years have paid a great deal of attention to the question of water supply. In 1864 I was employed in making an investigation into the geological surroundings of Cheltenham, in reference to the quality of the water obtainable from the springs that break out under the escarpment of the oolites. I examined, I think, as many as 80 localities where water broke out occasionally, and I obtained as much evidence as I possibly could with regard to the quantity of water. I came to the conclusion that the total quantity was exceedingly small—not more than about 300,000 or 400,000 gallons per day, taking the average flow of the year. I have examined the country round Cheltenham with reference to the mode in which the rainfall



would make its appearance in springs, and could be collected in the Valley of the Chelt. The rainfall on the hills would be, perhaps, 30 inches; but in the Valley of the Chelt it would certainly be very much less. The fall on the hills flows towards the Thames. The rainfall which would take its way to the Chelt Valley, and which could be depended upon, would be too small to supply sufficient water for the town of Cheltenham. The supply obtainable from the springs, and the supply obtainable from the rainfall would not, in my opinion, be together sufficient for Cheltenham. If the springs were all collected, and carried into a reservoir (supposing a reservoir could be constructed that would hold them all) necessarily the supply for agricultural purposes on the hills on the inside of the escarpment would fail, and cultivation would be almost impossible. The land in the neighbourhood of Cheltenham is entirely clay, which depends for its supply of water upon the tributary rills that flow over it. I know the Severn exceedingly well. The whole drainage area of the basin of the Severn is composed on the western side of silurian rocks and altered rocks—for the most part very much altered—of old red sandstone, rocks, which are very hard, and not at all capable of supplying any large quantity of mineral matter to the water that runs off them. The water is not absorbed readily by them. The eastern watersheds are different. They are composed of new red sandstone, and the consequence is that, while the tributaries that come into the Severn from the west are remarkably free from mineral matter, and generally very soft, those that come from the new red sandstone on the east and north-east are invariably loaded with mineral matter obtained from the new red sandstone, a certain quantity of carbonates of lime and magnesia, and aluminous and saline matter. The ground is very mountainous on the western side, while the watersheds on the eastern side are all at a very low level. The Severn water is very soft, so far as all the western tributaries are concerned, and moderately hard so far as the new red sandstone is concerned. Taking it altogether, it makes a water of medium hardness, and is of very good quality in other respects. It is not what I should call a very soft water, but rather inclines to hardness, owing to the new red sandstone. I carefully examined the course of the river between Tewkesbury and Worcester, and I suggested a great many of the points at which the samples were taken. I endeavoured to obtain evidence of what would be the effect upon the water of running over a bed that must, of course, inevitably have received a certain quantity of organic matter from the towns, and the result showed that the water at Tewkesbury was, if anything, a little better than the water above Worcester, though it contained a trifle more saline matter, and also a very small quantity of those mineral matters which necessarily are added to a water when it runs over a bed such as the new red sandstone. The intake is a little below the bridge at Tewkesbury. I heard it stated in evidence that there was an increase in the amount of chlorine at a point between Worcester and the intake—near the intake. It was my suggestion that that might be due to the presence of a bottom salt spring. Undoubtedly there are geological reasons for the existence of such a spring. In the first place, the new red sandstone is never without such springs. The upper members of the new red sandstone are the salt-bearing strata of England and most other countries, and eminently so in that part of England a little to the north. The mineral springs at Cheltenham show very clearly the condition of the rocks there, and the extreme probability of bottom springs existing in various parts of the Severn's course. The Ordnance Survey map also shows that in the neighbourhood of the river thereabouts there are longitudinal faults connected with the lias which covers the new red sandstone, and one of these faults crosses the river pretty nearly in the place where the water suddenly becomes unusually salt. I have seen the water at Hewletts reservoir. It is spring water, and hard. Judging from the analyses, I should say that that water would be decidedly improved if the Severn water was mixed with it. It would be softer.

Mr. BROWNE (in cross-examination): I think you have confined yourself to geology?

Witness: My work has been connected with the applications of geology. We know you have been very much interested in water supply, but you have not devoted yourself to chemistry?—Not to chemistry.

How long ago did you make the investigations which are the foundation of your evidence here to-day?—I have known the neighbourhood for a very long time—20 or 30 years, I suppose.

But you have made no examination since 1864?—No special examination.

Did you give evidence before the Committee who sat on this Company's Bill in 1865?—I believe I did.

And you gave similar evidence to what you have given to-day?—I presume so.

And, notwithstanding that, the Company had to continue to supply from the present springs?—I do not know the results.

Mr. BAZALGETTE: That is entirely wrong, because the Company obtained power to introduce Severn water at Tewkesbury.

(To be continued.)

## Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

MONDAY, APRIL 1.

(Before Vice-Chancellor MALINS.)

HIRST v. LONGWOOD GAS COMPANY.

(Continued from p. 519.)

Mr. RIGBY resumed the argument on behalf of the plaintiffs.

Mr. HIGGINS: If they will give us clean water from a 1-inch pipe, we will say nothing about the counter claim for costs.

Mr. RIGBY: The costs are a very serious question. The course taken by the defendants was such that it was impossible for us to stay proceedings. In their affidavits they call in question all our witnesses have said, and put us to prove, by additional evidence, what they have stated.

The VICE-CHANCELLOR: More than 600 folios of affidavit upon a question whether the defendants were conducting properly their excavation for a gasholder.

Mr. RIGBY: Our affidavits showed that from August to December they had been continually pelting us with stones, varying from 28 lbs. downwards, and the last of which we complained particularly was on Dec. 14, 1876. They said it should not take place again, but they had said so over and over again.

The VICE-CHANCELLOR: What case have you after the 14th of December?

Mr. RIGBY: We have no case of a stone coming afterwards. But what did take place after the 14th of December was, that, having taken absolutely no precaution to shore up the earth surrounding their excavation, on the night of the 20th an additional slip took place, which reduced our occupation road, which was 20 feet wide up to that time, to 8 feet 6 inches, and our writ was issued on the 21st. If a man is excavating, he is bound to carry on the operation in a way not to injure his neighbours, and if he does, those neighbours have a right to ask the protection of the Court. The plaintiffs did so, and in consequence of the protection so afforded, the

excavations have since been carried on in a way we should not have complained of if they had been so conducted from the first.

The VICE-CHANCELLOR: Is this a large Gas Company?

Mr. RIGBY: A large Company. The gasholder building is 100 feet in diameter. But, large or small, they ought to have conducted their works so that no injury should accrue to their neighbours. If they had gone on as they were proceeding, we should have lost all our road, and got no access to our mills. Therefore, as regards the commencement of the action, it is impossible to suggest it was not rightly commenced. They bring forward evidence to show that, if the excavations are conducted with due care, no injury will accrue. We say there was not due care, and there is nothing to deprive us of our right to costs. They did not on the 18th of December take precautions, knowing we were about to take proceedings, for they had seen our surveyors and other witnesses, and that we intended to have issued the writ. But we rely on the destruction of the road on the 20th of December; and in the following May it fell in again after they had restored it. The plaintiffs have throughout only been trying to make the defendants do what was proper, and so conduct their works as to cause no injury. The plaintiffs have practically had the advantage of the interim order.

The VICE-CHANCELLOR: They have restored the road now?

Mr. RIGBY: Yes, during the progress of the action.

The VICE-CHANCELLOR: How long did it take?

Mr. HIGGINS: It was commenced before the writ was served, and it took six days to complete it.

Mr. GLASSE: And it fell afterwards.

The VICE-CHANCELLOR said he believed that the parties got very angry with each other. They began a warfare of affidavits, and now somebody had to pay for them.

Mr. HIGGINS said one of the plaintiffs was a Director of a rival Gas Company, and was very angry.

Mr. GLASSE followed for the plaintiffs, and said, assuming there was justification for issuing the writ, inasmuch as the road was destroyed, stones were being thrown, and there was considerable damage, what then became the duties of the parties? If the defendants really meant to remedy it, what they should have done would have been to say "We have done all this; we are sorry for it, we will not do it any more. Do not go any further with your action; we will submit and pay costs up to the present time." But they had filed an enormous number of affidavits which had nothing to do with the real question, which was whether there was a good ground for the suit on the 21st of December. All the affidavits went to show what had been doing since, which, he contended, admitted the nuisance. Therefore the whole question was whether on the 21st of December, when the writ was issued, the plaintiffs had good cause of complaint. This, he contended, was abundantly made out, and, therefore, asked for the costs of the action.

The VICE-CHANCELLOR said he did not understand why, when the injunction was obtained on the 23rd of December, the defendants did not say they were not going to do the plaintiffs any harm.

Mr. HIGGINS: We have always said so.

Mr. GLASSE replied that they must not only have said that they were not going to do the plaintiffs any harm, but that they would pay costs up to that time.

The VICE-CHANCELLOR: What is the population of Longwood?

Mr. HIGGINS: About 5000.

The VICE-CHANCELLOR: Is there a large consumption of gas?

Mr. HIGGINS: Yes, my Lord.

Mr. GLASSE said there must be, because by the Act of Parliament their capital was £44,000, and they had power to raise additional capital to the extent of £25,000. There were about 25 mills there. They seemed to have used an "affidavitometer."

The VICE-CHANCELLOR said everybody must agree there were too many affidavits on each side.

Mr. GLASSE said that might be so, but it was for his lordship to say who was to pay for them.

Mr. HIGGINS said the Court had only heard of two grounds of complaint—one about the occupation road, and the other about the blasting and the hurling of stones in the excavations for the gasholder. He should confine himself to those, and leave out the other topics, such as apprehended injury to a cottage of the plaintiffs and the boundary wall of the plaintiffs. He asked that the action might be dismissed with costs. As to the occupation road, the plaintiffs never were entitled to an injunction, because the whole of the excavations affecting it were completed by the defendants about the 10th of December, 1876. The plaintiffs knew that perfectly well, because they were within a few yards of the *locus in quo*, and knew nothing more was to be done. In respect to the blasting, the matter stood thus: There was no evidence of a stone having fallen on the plaintiffs premises on any particular days, except, at the outside, four days—Aug. 30, Dec. 11, Dec. 12, and Dec. 14. As to the stone that fell on Aug. 12, which was said to have hit a man named Hoyle on the head, all he could say was that a stone falling a great distance on a man's head must have had some result; but when he was seen he said it did not hurt him, and he thought his lordship would come to the conclusion that that complaint was of small importance. As to the blasting, what happened in August came by great surprise on the defendants. They commenced to reinstate the matter, and do all they could to put the plaintiffs right. They repaired the roof, and gave them full satisfaction long before December. After the accident in August, Mr. Pearson, the contractor, took all the precautions he could, and there appeared to have been no accident of any sort, and no ground of complaint, from the 30th of August until the 11th of December. Upon that date it was said a stone fell on the skylight, and Hoyle was struck, and that on the 12th and 14th stones came over the shed. The defendants had great doubt about that. A stone was said to have been flung over a mill 60 feet high in a manner almost physically impossible. On the 14th of December, when that happened, Mr. Pearson, the contractor, saw one of the plaintiffs, went into the matter with him, and agreed so to arrange the blasting operations that it was absolutely impossible for any accident to occur, and he undertook that no more blasting of any kind should take place till the precautions were complete. Mr. Pearson said he would so arrange the blasting that no stone should fly to the plaintiffs premises. He would erect a gallery to cover the blasting operations, so as to enclose the *locus in quo* where the blasting operations were going on. He stopped the blasting altogether from the 14th to the 18th, in accordance with his promise. On the 18th of December he finished the construction of the gallery which he was then making; he covered it in with planks, and from that day forward there never had been a pebble thrown on the plaintiffs land or outside the gallery. It was physically impossible for any kind of damage or risk to be occasioned to the plaintiffs. That was completed five days before the writ, and certainly within the eyesight of the plaintiffs, who were lookers-on.

Mr. RIGBY replied that Mr. Pearson stated he did make the promise on the 14th, and proceeded forthwith to give effect to it. The occupation road remained intact from the early part of September until November.



In November there were one or two small slips in the road. On Dec. 15 there was a larger slip, and on Dec. 28 another slip.

The VICE-CHANCELLOR intimated an opinion that he thought it was unnecessary to come to the Court about the road.

Mr. HIGGINS said there was nothing to complain of about the road until the slip of the 15th of December, and then there was no real damage done. On the 20th of December there was a slip. The cause of that was that there was a drain which came along the road from the plaintiffs premises to the defendants premises.

The VICE-CHANCELLOR said if there was a slip caused by the defendants works they were bound to replace it.

Mr. HIGGINS: We did. That slip never would have occurred but for the wrongful act of the plaintiffs themselves. There was a drain coming along the road from the plaintiffs premises on to the defendants premises. Some years before the Huddersfield Water Company had put some of their main-pipes on the road, and the plaintiffs disconnected a drain from the brook in consequence. At the time the Water-Works Company laid down the drain, the brook was dry, and they did not think the drain was of any importance; but in winter that drain became very important, and owing to what the plaintiffs themselves did, that drain discharged itself into the road, and owing to the geological structure of the road, the effect was that of which the plaintiffs complained, but which, in truth, they had caused.

The VICE-CHANCELLOR said he thought the justice of the case would be met by leaving both parties to pay their own costs. There had been undue haste on the part of the plaintiffs, and unjustifiable resistance by the defendants.

Mr. HIGGINS repeated that the subsidence of the road was owing to the unreasonable course the plaintiffs had taken. The real damage having occurred on the evening of the 20th of December, the defendants at once, without a moment's delay, on the 21st of December, had planks put upon the road, and the men were there for the purpose of commencing the repairs before the writ was issued. In fact, they had commenced those repairs and had completed them, and had the road in perfect order by the 27th. The question, then, was, what the damage was the plaintiffs had sustained. No doubt the road was narrowed for six days, but the traffic was never stopped for a minute.

The VICE-CHANCELLOR: Can you get to your mill in another way?

Mr. RIGBY: Yes, my lord, but by a much more inconvenient way. The other road is never used.

Mr. HIGGINS said there was no evidence of a cart being stopped for a minute. In order to prevent any risk, the defendants put up a gas-lamp, and did everything they could to prevent inconvenience. It was not shown that the plaintiffs had suffered a shilling's worth of damage. Being brought to Court, the defendants looked into their rights. They said the plaintiffs were attacking them, and they had been polluting their water for years. He offered to have a single inch pipe placed where the water came to the plaintiffs, so that the defendants might have a supply of pure water.

Mr. RIGBY said the defendants had water from the Huddersfield water-works, and they could have it to any extent they liked.

Mr. HIGGINS replied that in consequence of the plaintiffs polluting the water the defendants were compelled to get water from the Huddersfield water-works, and pay £12 a year for it.

Mr. CALDECOTT (on the same side) said the Court always considered the circumstances of the case, and there was no absolute rule, that the defendants should pay costs, such as that upon which Mr. Glasse had relied. The plaintiffs had commenced the litigation hastily, and unnecessarily, and therefore they ought to pay the costs. He then proceeded to read affidavits.

The VICE-CHANCELLOR said if the defendants had conducted their case more reasonably he might have dismissed the Bill with costs.

Mr. CALDECOTT hoped his lordship would do so now. He then continued with the further reading of the affidavits, on the number and length of which his lordship constantly expressed his great dissatisfaction. The learned counsel said, as to the counter claim, the brook which was alleged to have been polluted came from the defendants premises, and afforded them a convenient mode of obtaining water.

The VICE-CHANCELLOR said the plaintiffs had made a claim against the defendants, and the defendants thought they would make a claim against the plaintiffs.

Mr. CALDECOTT said that probably the defendants would have brought a separate action.

The VICE-CHANCELLOR: I think this is a mere afterthought.

Mr. CALDECOTT said if the defendants had not been attacked they would have gone to their neighbours and put their case before them, and if those neighbours had been reasonable, they would have acceded to their request.

The VICE-CHANCELLOR: I shall not go into that.

Mr. CALDECOTT: I must ask your lordship to do it, because it is a matter of their fouling a brook as far back as 1859.

The VICE-CHANCELLOR: You must file a new claim, then, if you insist upon it.

Mr. CALDECOTT: I hope you will not put us to that expense.

The VICE-CHANCELLOR: Yes, I shall.

Mr. CALDECOTT: That has not been objected to.

The VICE-CHANCELLOR: I object to it very much.

Mr. CALDECOTT: The plaintiffs do not.

The VICE-CHANCELLOR: I shall not prejudice you in the slightest degree, because I strongly suspect it is a mere afterthought.

Mr. RIGBY was then heard in reply, and said it was the first time that defendants had made it a merit that they had not disobeyed the injunction of the Court. They picked out certain affidavits by which it was possible to reduce the case to an absurdity, no doubt. Mr. Pearson's evidence about the stone on the 11th of December was totally inaccurate, especially when he said that the stone could not be found. The evidence of two workmen in the employment of the plaintiffs showed that the reason why the stone could not be found was because the dye-house was full of steam; but the stone was found the next day.

The VICE-CHANCELLOR: Did you write and say that you must take proceedings unless the defendants desisted.

Mr. RIGBY said it was no use writing when they could see them by merely walking over to their premises. The plaintiffs witnesses, one of them being the Borough Surveyor, said that not only actual damage was sustained, but there was the fear of much more substantial damage being apprehended. Mr. Crowther said, in his judgment and belief, the surface of the plaintiffs mill-yard, together with the boundary wall, would, long before the completion of the excavation, if continued as hitherto carried on, have slipped away. Judging from what was done before, was it not certain that, if the action had not been commenced, that would have been so? The plaintiffs had proved by the evidence that it was only under stress of the order of the Court that the danger was prevented. When persons were carrying on a large business, and when their Surveyor told them that the road would be lost which led to their mill, or would slip away before the excavations were finished, it was essentially an important

matter, taken together with the fact of the danger to all the workpeople from the stones flying about.

The VICE-CHANCELLOR: When was the fixing of the gasholder completed?

Mr. CALDECOTT: In June, 1877, I am told.

Mr. RIGBY said he could not have imagined a case in which it was more proper to come to the Court when the contractor acknowledged that what was complained of was owing to the carelessness of the workmen.

The VICE-CHANCELLOR, in giving judgment, said the plaintiffs were carrying on large dye-works at Longwood, near Huddersfield, and the defendants were the Longwood Gas Company, and Mr. Pearson, their contractor. They had premises immediately joining the plaintiffs, and were excavating in the summer of 1876, particularly in the months of August and September, for the purpose of erecting a new gasholder of very large dimensions—namely, 100 feet in diameter. Longwood was said to be a place in which there were 25 mills, and in which, therefore, the consumption of gas would be very large. In the course of excavating for the erection of the new gasholder, it became necessary to carry on some blasting operations, and in the months of August and September, and down to the middle of December, 1876, some inconvenience, and he thought some danger to the plaintiffs, arose in consequence of the operations of the defendants; but he was satisfied, upon the evidence, that there was no blasting after the 14th of December, which could not be guarded against by the defendants, or which the defendants were not perfectly willing to do everything that was necessary, under the circumstances, to protect the plaintiffs against. He was satisfied that since the 14th of December, 1876, they had not experienced any inconvenience from the blasting operations. There was an accommodation road, which was somewhat more than 20 feet wide, and, for the purposes of these works, the defendants caused the slipping down of a part of the road, so that at one time the 20 feet was reduced to about 9 feet. But he was satisfied that there never was on the part of the defendants any intention of permanently interfering with the road. He was also satisfied, from the evidence of the Contractor and the Manager of the defendants works, that the interruption would be a temporary one, and that in a few days whatever was done would be set right again without the institution of the suit. The writ was issued on the 20th of December, and then the very unusual course was taken on the 23rd of December of attending before Mr. Baron Pollock, who was the Vacation Judge, and upon the representation made to him he granted an interim order extending until the second motion day in Hilary sittings. The matter came on on the 15th of February, when Mr. Glasse addressed the Court for a few moments, and upon the representations then made the interim injunction was continued, no one appearing for the defendants. The injunction came to an end some time afterwards. He was perfectly satisfied that a little forbearance on the part of the plaintiffs would have rendered the suit totally unnecessary. The operations of the defendants were substantially over; and had it not been for some very angry feeling, he was perfectly satisfied that to come to the Court was wholly unnecessary, either on account of the blasting, or the interference with the road. He could attribute the institution of the suit to an angry feeling between the parties, who had indulged in filing affidavits. What ought, therefore, to be done? He was much inclined to think that if the defendants had adopted a reasonable course—that is, if they had put in a short affidavit, or written a letter saying they did not intend to excavate any further, and would take every proper precaution—the whole litigation might have been brought to an end. Instead of that, they filed very long affidavits, which were replied to by the plaintiffs by another long batch of affidavits. An injunction was useless, because it was admitted that the work was over and the gasholder fixed. It was a mere question of costs. As to these he thought both parties had been very unreasonable and vexatious, for which they both richly deserved to suffer in costs. If the defendants had conducted their defence properly, he thought he should have dismissed the Bill with costs. But, instead of being reasonable, they had been as vexatious on their side as the plaintiffs had been on theirs. He came to the conclusion that both parties had been so wrong that he should dismiss the Bill without costs. As to the counter claim, he declined hearing it, because it was not a counter claim arising out of the dispute. That would also be dismissed; and, desiring to make the defendants suffer for the length of the affidavits, he should dismiss the counter claim with costs.

Mr. CALDECOTT: That is without prejudice to any action with reference to the right to the water?

The VICE-CHANCELLOR: If you wish it.

#### STAFFORDSHIRE SPRING ASSIZES.—TUESDAY, MARCH 26.

(Before Justice DENMAN and a Jury.)

TURNER v. HEDNESFORD GAS COMPANY.

Mr. POWELL, Q.C., and Mr. ANSTIE appeared for the plaintiff; Mr. MATTHEWS, Q.C., and Mr. YOUNG for the defendants.

The plaintiff in this case is a contractor, of Wednesfield, and the action was brought to recover damages from the defendants, a Gas Company in Staffordshire, for breach of contract. The plaintiff alleged that, having agreed with defendants to construct a gasholder-tank for them for the sum of £745 5s. 3d., the defendants, on Aug. 13, 1877, prevented him from proceeding with the work, and seized his tools and plant. The defendants alleged, in reply, that the plaintiff failed to carry out the works with reasonable expedition, or to carry out the instructions of their Engineer, Mr. Thomas Proud, and that, therefore, in accordance with the provisions of the agreement, the defendants took the work out of plaintiff's hands, and also took possession of materials to the value of £30. They denied, however, having taken possession of any tools. The defendants had also made a counter claim against the plaintiff and one William Round, the plaintiff's surety, in which they alleged that, by reason of plaintiff's default, they had to pay for the tank £254 14s. 9d. more than they would have had to pay under the contract.

Mr. POWELL, in opening the plaintiff's case, said that on the 2nd of July, 1877, a contract was entered into between the parties, under which plaintiff was to construct a brick gasholder-tank for defendants for the sum of £745 5s. 3d.; but before he could complete it the defendants interposed and prevented him executing the contract. It was a part of the contract that the work should be carried out according to specification, and the specification contained the following provision:—"The whole of the work will be carried out to the entire satisfaction and under the superintendence of the Company's Engineer, Mr. J. McMillan, of Stoke-on-Trent, and all questions as to the quality of materials and workmanship shall be judged by him, and his decision shall be final and binding upon the Contractor." Mr. McMillan set out the ground, and the work was commenced early in July. The plaintiff carried it on into the month of August, and that without any intervention on the part of Mr. McMillan. Plaintiff was doing the work well and properly, and in accordance with the specification. On the 24th of July, at which time plaintiff had done work in respect of which £150 was paid him, the scene was visited by a gentleman unknown to the plaintiff, and who inspected the works. The plaintiff knew the gentleman was an Engineer, but, inasmuch as he was



conscious of doing his work well, he did not much care who he was. On the 30th of July the same gentleman came again, and then stated that his name was Proud, and that he had become Engineer to the Company in the place of Mr. M'Millan. In that capacity he went over the works, but made no complaint. In a day or two afterwards, however, a person employed by the defendants upon the works brought a telegram to the plaintiff, which he said he had received from Mr. Proud. The message required that elm planking should be put under the brickwork of the tank. The specification said nothing about planking, and also provided that no extras should be charged except for additional work done on the written order of the Engineer of the Company, the Engineer of the Company being, as shown by the contract, Mr. M'Millan. Under these circumstances plaintiff took no immediate step. The next day Mr. Proud himself came over, and ordered the work to be done which was referred to in his telegram. No written order, however, was given, and the plaintiff went on with the work as before until Saturday, the 11th of August. On the following Monday he and his workmen were shut out of the ground by an officer of the Company, and were not even allowed to fetch away their tools. On the 14th of August the plaintiff went to Mr. Proud, at Birmingham, and asked for an explanation. Mr. Proud professed not to understand the matter, and referred the plaintiff to the Company. The next day the plaintiff went again to Birmingham, and met Mr. Proud with one of the Directors. He was simply asked whether he was willing to give up the contract. He replied that he was, upon proper terms. Plaintiff was told that there was a meeting of the Directors on the 25th, which he might attend. He attended, but was not admitted. When the Directors had finished their deliberations, plaintiff was told that he would be written to, and he afterwards received the following resolution:—"The question of Mr. Turner's claim was fully considered, and the Directors feel that they have no alternative but to abide by the specification." Plaintiff was willing to abide by the specification, and asked for damages. Respecting a counter claim of £254 15s. 9d., set up by the defendants, it was submitted on behalf of the plaintiff that he had nothing to do with it, inasmuch as it was a matter between one of his sureties and the defendants.

In support of the case plaintiff himself was examined, as was also the foreman of his works, Mr. John Gough, and a Civil Engineer, Mr. James Cope.

WEDNESDAY, MARCH 27.

Mr. MATTHEWS addressed the Jury in defence, and contended that the contract had not been carried out by the plaintiff in a manner satisfactory to the Company's engineer. Mr. Proud found that plaintiff had not carried on the work in accordance with the contract. If plaintiff had been allowed to proceed with the work as he was doing, it would have resulted subsequently in danger to the property of the Company. The most essential feature in the erection of the tank—viz., puddling—had been neglected, and there was danger of the walls falling in from want of timbering.

The Secretary of the Company proved that Mr. Proud was the Engineer appointed on the 28th of July.

Mr. Proud was then called, and stated that he had had large experience in constructing gas-holder-tanks. He made an examination of the works, and found that the sides of the tank were in such a condition that they would have fallen in, as the proper timber supports were not put in. His instructions as to timbering were not carried out. It was absolutely necessary that such timbering should be attended to, in order to construct a proper tank. The Company had to purchase timber to complete the necessary work.

Cross-examined by Mr. POWELL, witness admitted that there was no mention of the planking in the specifications, and that he had never given plaintiff a written notice to put in elm timber.

Mr. Lycett, the Manager of the Company, was called, and stated that he examined the work on the 30th of July. There was only a small portion of brickwork, and the sides of the tank were falling in from want of timber support. If the tank was to be constructed properly, timbering would be required, which the plaintiff had not put in. In his opinion, he considered that plaintiff knew nothing about the erection of such tanks. The way in which plaintiff had gone about the work caused it to be "the laughing-stock of the place." With regard to the alleged detention of the tools, nothing had been retained but what was provided for in the specification.

Mr. John M'Millan was then examined, as was also Mr. Smith, a contractor of Stoke-upon-Trent. The latter agreed to do the work for £850, and took it in hand after the plaintiff had left it. On examining the work he found it in a tumble-down state, and he had to construct a new tank and alter the site, as there was not room to erect the new one. In his judgment, he should consider the value of the work done by plaintiff to be about £100.

Witness, in cross-examination, stated that the materials which had been sent by plaintiff were left there; but, so far as he knew, he could not say that any of them were used in the construction of the new tank.

Mr. Field, contractor, and Mr. Hazelour gave corroborative evidence.

His LORDSHIP having summed up,

The JURY, after a short deliberation, gave a verdict for plaintiff—damages £200, in addition to the sum of £150 which had been received by him. The counter claim was thrown out.

SURREY ASSIZES, KINGSTON.—SATURDAY, MARCH 30.

(Before Lord COLERIDGE and a Special Jury.)

WATTS v. THE WEST SURREY WATER COMPANY.

The plaintiff was a brewer, and the action was brought against the defendants for not supplying him with good and pure water fit for brewing, in consequence of which, as he alleged, he had lost some thousands of pounds he had invested in a brewery on the faith of a good supply.

Mr. GRANTHAM, Q.C., and Mr. LANE were for the plaintiff; Mr. WATKIN WILLIAMS, Q.C., and Mr. M'MILLAN for the defendants.

It appeared that the Company were incorporated by Act of Parliament for the supply of the district with water, and one of the clauses of their Act was that they might supply any person with water for other than domestic purposes, on such terms and conditions as might be agreed on between them and the party wanting the supply. In 1876 the plaintiff, a brewer, proposing to establish a brewery at Addlestone, within the Company's district, went to the Chairman of the Company and asked whether the Company's water was fit for brewing, and he replied that it was, and referred him to one Saunders, "to make inquiries on the subject." The plaintiff accordingly saw Saunders, as to whose office or position in the Company there was no express evidence, and he made certain statements to the plaintiff as to the Company's water, after which the plaintiff set up his brewery, which was supplied with water from the works of the Company. The brewery failed, as he alleged, through the bad quality of the water, and he accordingly brought this action, in which he sued the Chairman and also the Company, and complained that they, by the Chairman, and also by Saunders, who, he alleged, were authorized for the purpose, "informed and warranted" him that the water would be "good and pure, and fit for brewing family ales," whereas it was not so, and, on the contrary, was bad, impure, unfit for brewing family ales, contained matter injurious to health, and was unfit for use. The plaintiff, before he dis-

covered the bad character of the water, brewed large quantities of beer and family ales, which, in consequence of the bad quality of the water, were rejected by his customers, and so his brewery was ruined, and he lost £10,000. The Company in their answer denied the alleged warranty, and denied that any one had been authorized to make it.

At the opening of the proceedings,

Lord COLERIDGE intimated that, in his opinion, there was no case against Mr. Hook, the Chairman, and he was accordingly dismissed from the action.

The plaintiff was then called to prove the alleged warranty by Saunders, to whom he had been referred by the Chairman "to make inquiries on the subject."

Mr. WILLIAMS objected that there was no authority to make the alleged warranty, and

Mr. GRANTHAM admitting that he had no express evidence that Saunders was a general manager,

Lord COLERIDGE held that, in the absence of any further evidence as to his authority, he should hold that he had no authority to make such a warranty.

Mr. GRANTHAM made an attempt to support the case, on the ground that the water was not good and pure, and that thus, apart from any warranty, the action could be maintained; but

Mr. WILLIAMS urged that this was not the case made by the claim, which was really founded on the warranty.

Lord COLERIDGE was of that opinion, and, therefore, held that the action failed, though, on Mr. Granttham's application, assented to by Mr. Williams, he said he would give leave to the plaintiff to amend his statement of claim, on the payment of the costs which had been occasioned by the claim in its present form.

BROMPTON COUNTY COURT.—WEDNESDAY, APRIL 10.

(Before Serjeant WHEELER, Judge.)

LABOURERS AND THEIR WAGES.

William Penn, late a stoker in the employ of The Gaslight and Coke Company at their Fulham Station, brought an action against the Company to recover the sum of £1 4s. 11d., wages due to him at the time of his dismissal from the service of the Company.

Mr. HAYNES appeared for the plaintiff, and Mr. NEWMAN for the defendants.

Mr. HAYNES, in opening the case, said the question was one of great importance, as his client was one of a large gang of men who had been summarily dismissed from the Company's service for refusing to do work other than that which they were specially engaged to do; the Company at the same time declining to pay them the wages due at the time of their dismissal. He called

William Penn, the plaintiff, who stated that he had been in the employ of the Gas Company about two years. The gang he belonged to were engaged in charging the retorts used in making gas, it also being their duty, once a month, to chip the left side of the mouths of the retorts, another gang doing the right-hand side. The witness explained that the chipping was rendered necessary, owing to the quantity of tar and other matter corroding on the mouths of the retorts. On March 14 the plaintiff and his mates had finished their day's work, when the foreman stoker came up and ordered them to commence chipping the right-hand sides of the retorts. This they declined to do, as it was no part of their duty, and they had never before done it. Upon this they were dismissed from the employ, and informed that the wages due to them were forfeited.

Several other men forming part of the gang were called in corroboration, and stated that they had been at the work several years, and had never once been called upon to chip the right-hand sides of the retorts; they had always done the left.

Frederick Macchell, chief foreman stoker, said it was by his orders the men were told to chip the right sides; they had never done it before. When they declined to do it, a quarter of an hour was given them to consider the matter; but as they steadily refused, they were immediately sacked.

Mr. F. M'Minn, resident Engineer to the Company, said he had never before known the men to refuse to change over; in the present case it was absolutely necessary that it should be done. He spoke to the men, and told them that, by the fact of their declining to do their legitimate work, they had forfeited the pay due to them.

The JUDGE, in summing up, said it was clear to him that the plaintiff had performed the duties assigned to him, and he had acted very properly in declining to do any other work; he had been corroborated by several witnesses, who gave their evidence in a clear and truthful manner, and he believed their word, although they were only poor working men, the same as he would that of the highest person in the land if he were brought before him. He should give a verdict for the plaintiff for the full amount claimed, with costs.

BRIGHTON POLICE COURT.—WEDNESDAY, APRIL 3.

(Before Mr. A. BIGGE, Stipendiary; Alderman MARTIN, and Mr. HOLLIS.)

THE CORPORATION OF BRIGHTON v. COWELL.

ILLEGAL USE OF WATER.

Samuel Cowell, provision dealer, North Street, was summoned "for that he, on the 22nd day of March, 1878, having from the Corporation of Brighton a supply of water for other than domestic purposes, to wit, for one horse and one carriage, did use for other purposes than those for which he was entitled to use the same, to wit, for two other horses and three carriages, the water supplied to him by the said Corporation, contrary to the statute in such case made and provided." The proceedings were taken under the 26th and 27th Vict., sec. 18.

The TOWN CLERK appeared to support the complainants; the defendant being represented by Mr. F. MERRIFIELD.

Mr. H. Beach, one of the inspectors of the Corporation Water-Works, said he inspected the premises occupied by the defendant, 48A, Portland Street, on the 19th of March last. The premises were stables, and he found in them three loose boxes, two horses, and a pony. There were two vans, one cart, and a four-wheel chaise there. At that time he did not know what water-rate Mr. Cowell was paying. He also saw the adjoining premises on the 22nd of March.

Cross-examined by Mr. MERRIFIELD: Witness examined the premises in Mr. Lambert's time, about the end of 1876, and he remembered that Mr. Lambert had a pony and a potato van. The visit on the 19th of March was the first visit of inspection he had paid since defendant had been in possession.

Mr. Holland, manager of the water-works, produced an account of the water-rate against the defendant, which was for trade purposes. The amount of charge was £1 3s. 6d. No contract had been made by the defendant for water supplied to him by the Corporation.

Mr. MERRIFIELD submitted that, that being so, there was an end of the case. The Corporation should have made a contract with him, or made any charge they thought proper.

Witness said that there had been previous contracts made with Mr. Lambert and Mr. Hopkins.



Mr. MERRIFIELD could not see how the contracts of the two former tenants were binding on his client.

The TOWN CLERK: I shall be able to show that he has made it binding by paying the same amount as the previous tenant.

Mr. MERRIFIELD said the Corporation had assumed, without taking the trouble to go and see, that the number of horses and vans were the same as before.

The TOWN CLERK said, by the Act of Parliament, the tenant had no right to use the water until he came to the Corporation and made a contract.

Mr. MERRIFIELD: My contention is that my client paid whatever he was asked to pay, and that he would have paid all he was asked to.

Witness stated the premises occupied by Mr. Lambert were rated at 10s. 6d., those occupied by Mr. Hopkins, adjoining, 13s., making £1 3s. 6d. in all, though they had separate entrances. Defendant had made no application for an increased supply of water, nor given any notice with reference to it. He had occupied the premises about twelve months.

The TOWN CLERK proposed to ask witness what the Corporation charges were for the number of carriages and horses the defendant had.

Mr. MERRIFIELD objected to this question, and said there was nothing to guide any one as to the charges, until they were brought to the Court in this way. He contended that, in the accounts sent, there were no particulars of how many horses there were, or how many carriages.

Mr. W. SMITHERS, one of the collectors for the Corporation Water-Works, proved that, for the two half years, 1877, 5s. 3d. each had been paid, making 10s. 6d., by the defendant, in respect to the premises, 48a, Portland Street. That was a special charge, not a rate, for a supply for other than domestic purposes.

In cross-examination, witness said the demand-note set forth 5s. 3d. for stable; that was all the information given to the tenant. The receipts were more vague, merely saying for water-rate and charges. All the conversation he had with defendant was that he said the charges were high enough. No conversation as to the number of horses and carriages the defendant kept took place, and witness never suggested that he ought to pay more. Supposing a person did not know what he had to pay per carriage or per horse, the only instruction he had was on the back on the demand-note. The same amount was paid by the previous tenant.

The TOWN CLERK said he now proposed to ask what was the scale charge for the number of horses and carriages the defendant kept.

Mr. HOLLAND was recalled, and, in reply to the TOWN CLERK, said the sum payable for the carriages and horses found on the premises of the defendant would be £2 12s. 6d. per annum.

Witness, in reply to Mr. MERRIFIELD, said the Water-Works Committee decided as to the special charges. They charged 10s. 6d. per stall generally, but in the case of Mr. Lambert they charged for one only, because they knew he had only one. Defendant had given the Corporation no chance of making a contract, because he had gone on using the water surreptitiously. Defendant had no right to use the water without coming down to the water-works office and giving notice. If he had done so, it would have saved all this trouble.

Mr. MERRIFIELD said there was another thing that would have saved trouble, and that was if the water-works people had gone down to defendant and told him that the price to pay for what he kept was £2 12s. 6d. For the defence, he submitted that Mr. Cowell took possession of the place from a Mr. Hopkins, and he had not the slightest motion that the Corporation charged according to the number of horses and carriages. He thought the use of the word "surreptitiously" on the part of last witness was utterly unjustifiable, and could only have arisen from his ignorance of the English language. He argued that no contract had been proved with the defendant, and on this head the case fell to the ground. Then supposing there had been a contract, it was assumed that the contract of the former tenant was binding on the defendant. That, he contended, was the fault of the Corporation, who should have sent an inspector down to the premises, or have taken the consequence. Further, he argued that no intimation had been given to the defendant by the Corporation, and that if the law could sustain this summons, the mode of conducting the business of the Corporation water-works was most unfair. There was nothing in the demand note, he thought, that could inform Mr. Cowell as to what he was expected to pay, and therefore, under all the circumstances of the case, he asked the Bench to dismiss the summons.

The Magistrates retired for a few minutes, and on their return, The STIPENDIARY said the case turned chiefly on the instructions set out on the back of the demand-note, from which it appeared that defendant was liable to a penalty not exceeding £10 if he did not enter into a contract. He must, therefore, be held to have adopted the contract of the previous tenant, Mr. Hopkins, who had one horse only, but had used a great deal more water than he was entitled to under that contract. The Bench would, therefore, convict him under the clause of the Act; but as the Corporation had the right to sue him in the County Court for the water so misused, a fine of 5s. and costs would be imposed.

#### SURREY COUNTY BENCH, KINGSTON.—THURSDAY, APRIL 11.

(Before Major LAMBERT and other Magistrates.)

SECURITY FOR GAS-RATES.

William Richard Colyer, landlord of the White Hart Inn, Walton, was summoned for neglecting to give security for a supply of gas from the Walton Gas Company.

Mr. GEORGE HARDEN, Secretary to the Company, said that in March last a Mr. Chiddam occupied the house now kept by defendant, and left in that month, paying up all that was due from him for gas supply. When the defendant took possession of the premises, witness went to him and asked him for a deposit of £2, but this he refused to give. Afterwards a deposit of £3 was asked for, but that he also declined to pay.

Defendant, who was represented by Mr. BUCKLAND, expressed himself willing to pay for the gas a quarter in advance, but he was not content to pay a standing deposit for the Company to do as they liked with.

The BENCH made an order fixing the deposit to be paid at £3, and directed defendant to pay the costs, 12s. 6d.

#### SOUTHWARK POLICE COURT.—TUESDAY, APRIL 2.

(Before Mr. BENSON.)

SHAW v. THE SOUTHWARK AND VAUXHALL WATER COMPANY.

The plaintiff in this case, who is a printer, residing at 66, Borough Road, summoned the defendants for unlawfully refusing to supply him with water during the time for which the rates for such supply had been tendered by him.

Mr. WHEELER appeared for the complainant; and Mr. LANFEAR, Solicitor to the Water Company, conducted the defence.

Mr. WHEELER said the whole case turned on an agreement which plaintiff alleged was entered into between him and the Company some four or five years ago. The plaintiff, desiring a larger supply of water, for trade purposes, thought it desirable that he should, under the provisions of the Act of Parliament, get a meter. He did this, but there was some altercation concerning it. The result was a compromise, by which the Company agreed to accept in payment of any water that should be used by plaintiff

three guineas per annum. That was some time in 1872 or 1873. The plaintiff undertook not to use the meter, and he was to receive water at three guineas per annum, payable half yearly. The agreement was acted upon, and plaintiff was duly supplied with water, he making half-yearly payments of £1 11s. 6d. Some time ago, however, the Company determined to raise their rates, and in October, 1877, the plaintiff received from them an account for the half year ending the previous September of £2 7s. 6d., instead of £1 11s. 6d., as he had previously paid. Plaintiff was surprised at the Company ignoring the agreement, and he wrote to them, calling their attention to the supposed error which had been committed. In reply, he received a note, in which it was stated that the charge made in respect to the house had been revised, the premises having previously been underrated. Nothing was said about the agreement. On the 20th of March last plaintiff went to the office of the Company, and tendered payment of £1 11s. 6d., but it was refused.

Mr. BENSON: Did he not pay the September water-rate till the following March?

Mr. WHEELER said the ordinary practice had been to pay five months in arrear.

Mr. BENSON: My Water Company have never given me six months credit. May I take it that he went on the 20th of March to pay the September rate?

Mr. LANFEAR: Such was not the customary time.

Mr. WHEELER said it was, in the plaintiff's case, the "habitual time."

Mr. BENSON: In fact, you say they gave him five months credit?

Mr. WHEELER said, that being the case, two days after the money was tendered—

Mr. BENSON: But the demand was for £2 7s. 6d.?

Mr. WHEELER said two days afterwards men were sent, and the water was cut off. That was a proceeding upon which he could not lay too much stress, as it stopped the plaintiff's trade, and caused his type, &c., to lie idle for several days. Plaintiff, of course, suffered great injury and damage by this proceeding on the part of the Company, and after some consultation with his friends, it was decided to take out a summons against the Company. There was a little irregularity in the summons.

Mr. BENSON said he failed to see where the irregularity was. It set forth that the Company, having undertaken to supply the water, had unlawfully refused to do it. To what particular section was attention to be directed?

Mr. WHEELER reminded the Magistrate that directly after the summons was issued the water was turned on again, and he relied on that as showing that the Company felt they were in the wrong.

Mr. BENSON said if he had not been of opinion that the Company had done something wrong, he should not have granted the summons; but what he now desired to be told was under what section plaintiff sought a remedy, or to enforce a penalty? As to the agreement, that was a matter of proof.

Mr. WHEELER said he relied on the 43rd section of 10 & 11 Vict., cap. 17, the Water-Works Clauses Act, 1847.

Mr. BENSON said that clause enacted that, "If, except when prevented as aforesaid, the undertakers neglect or refuse to furnish to any owner or occupier, entitled under this or the special Act to receive a supply of water, during any part of the time for which the rates for such supply have been paid or tendered, they shall be liable to a penalty of £10," &c. He apprehended, therefore, that the allegation of the plaintiff was that the Company had neglected to supply water during part of the time for which rates had been paid or tendered.

Mr. WHEELER said that was so. He depended to a great extent on the agreement, and did not purpose touching on the question as to the raising of the rates for such supplies of water. There had already been a case decided in this Court on that point. There the Company had cut off water, and the decision was against them.

Mr. LANFEAR said the case referred to did not bear upon the present one. There the money had been paid in advance, and by some inadvertence the cheque had been returned.

Plaintiff was then called, and examined by Mr. WHEELER. He said he had for some years carried on the business of a printer in the Borough Road. About 1873 he agreed to accept water from the Company at a certain rate, but finding that he used steam, the Company wanted him to pay £10 per year. He disputed that, and had a meter put on, when the Company made an agreement to supply him with water at £3 8s. per year, payable half yearly. That arrangement continued up to October last, when the Company decided on raising the rates, and a demand was made on him for £2 7s. 6d. for the half year ending September. He always paid his water-rate half yearly, within a few days of the next rate being due. He wrote to the Company about this extraordinary demand, and heard nothing more from them until the 20th ult., when he went to the office and tendered £1 11s. 6d., which he considered was the amount due. They refused to take this, and cut the water off a few days afterwards. The cutting off was done at the pipe outside, and that act, he considered, injured him in the eyes of his neighbours, and was unnecessary. He then took out a summons against the Company, and soon after they received it they put the water on again. He was eight days without water, consequently his business had been partially stopped, and a great deal of injury was done to him. When he took out the summons he doubted whether it would be successful, owing to the agreement to supply him not being mentioned.

Mr. BENSON said he was not responsible for the wording of the summons, but, as far as he could judge, it was correct, as it raised the question as to the Company giving a proper supply. He presumed what the plaintiff wished to argue was that, assuming there had been such an agreement, it was binding upon the Company, after the implied sanction by the operation of the agreement, to give a certain notice before altering the charge, as in this instance.

Mr. WHEELER said that was just so.

Mr. LANFEAR said the Magistrate might take it as a fact that there had been no decision as to the necessity of giving notice before the rates were raised.

Mr. BENSON said it was necessary sometimes to have recourse to exaggeration by way of illustration. If gas were supplied at so much per 1000 cubic feet, and one day a demand were made for tenfold the ordinary amount, would it be right to cut off the gas in two days afterwards? There was surely something of the same thing in regard to water. Was there nothing in the Water Company's Act directing that there should be a reasonable notice given?

Mr. LANFEAR stated that, under that very Act, notice had been given to the consumers as long ago as October. It should be remembered that plaintiff was tendering money six months after it had been due. He did not admit, however, that any notice was necessary.

Mr. WHEELER said after the summons was issued the water was turned on again, and an admission was made by one of the men that they had acted rather hastily in cutting the water off. The street was filled up again, and no action had been taken for the costs of opening it.

Mr. BENSON said he had very little doubt but that the Company had acted hastily. The only question was whether they had acted illegally. That was the only subject for argument.

In reply to the MAGISTRATE, it was stated that the money was tendered



on the 20th of March, that the water was cut off on the 22nd of March, and that it was turned on again on the 28th of March. Water was greatly needed in plaintiff's business for many incidental purposes, as well as for the steam-engine.

*Witness*, continuing, said he should not like to say what he had suffered through the water being cut off. The machine had to be turned by hand for two whole nights, so as to keep the best of his customers; and the water was sadly wanted to wash the types, formes, &c. The damage he had sustained was certainly not less than £5 per day. In fact, it would have better answered his purpose to have paid the money demanded, and the point could have been decided in the meantime. That was a course he thought the Company might adopt with their customers, instead of cutting off the water, as they had done in this case.

Mr. LANFEAR (to plaintiff in cross-examination): What is your consumption of water?

*Witness*: About 1000 gallons per week—sometimes more.

During the time you have taken water from this Company, have you been in the habit of paying your rates punctually when the collector has applied for them?—No.

Has he had to apply more than once?—Yes, I am very guilty in that respect. I do not pay my water-rates until the very last moment—just as the next quarter comes.

In fact, there has been a good deal of difficulty in getting them?—Yes; but that is no reason why I should be oppressed.

You admit that many applications had to be made to you for this particular rate?—Not for this, but for every one of them.

In further cross-examination, plaintiff said he received a notice on the 19th of March that, unless he paid the Michaelmas rate the next day, his water would be cut off. He then went and tendered the £1 11s. 6d., when the Company demanded £2 7s. 6d. He refused to comply with that demand, and on the following day his water was cut off.

Mr. BENSON said it did not matter whether the defendant was in arrears or not.

Mr. LANFEAR submitted that in order to enable plaintiff to take these proceedings, it was necessary, not only that he should have paid all the rates, but that he should have tendered the rate then in advance. That was clearly the case so far as the Act of Parliament was concerned. Plaintiff, however, only tendered £1 11s. 6d., and the Company's demand was £2 7s. 6d.

Mr. BENSON: Then you say he should have tendered in advance? Where is the section which enables you to cut off the water if the rate is not paid in advance?

Mr. LANFEAR said the Water-Works Clauses Act, 1847 (10 & 11 Vict., cap. 17), by section 70, gave the Company the right to demand payment of water-rates in advance, and by section 74 they had the right to cut off the supply if the rates were not paid.

Mr. BENSON: Is there anything in the Company's Special Act relating to this question?

Mr. LANFEAR said the Special Act provided that the whole of the Water-Works Clauses Act, with certain exceptions, were incorporated, and among the portions so incorporated were these two clauses.

*Witness*, examined by Mr. BENSON, said his premises were rated at £80 per annum, and he had but one water-closet on the premises. He was connected with the Company's high service, on the main. He employed a 3-horse power engine.

Mr. BENSON said the Company had the power, no doubt, under section 70, to demand payment of the rates quarterly in advance. He wished to know whether in this case they had been so demanded.

Mr. LANFEAR replied in the negative, and he denied that any agreement had been entered into with the plaintiff. If the figures were worked out, plaintiff could be made to pay £13 3s. per annum, so that the Company could not be charged with acting harshly. Instead of that, plaintiff's rate was merely raised to £4 15s.

Mr. BENSON (to Mr. Wheeler): The premises may or not be underrated, but at present the subject of argument is the section either in the general or the local Act bearing upon the payment of rates under demand. How does plaintiff get over that?

Mr. WHEELER said his client had paid as he had always been in the habit of paying.

Mr. BENSON said it appeared to him that the Company had acted hastily in this matter, and the question was to what extent the clauses in the Act justified the conduct of the Company. In one part it was stated that if the rates were not paid on such and such dates, the Company had the power to cut off the water; and on reference to the clause respecting payment, it was stated that it was to be in advance. His sympathies were with the plaintiff, because he thought it was a hasty action on the part of the servants of the Company; but he could not shut his eyes to these two sections, and if these held good, the penal clauses of the Act of Parliament could not be enforced, except by a party who had paid his rates in advance. His ruling would be that, in order to enable any person (any consumer) to put in action the penal section of these Acts, it was incumbent on him to prove that he had paid or tendered the water-rate in advance.

Mr. LANFEAR said the Company did not take such measures, except for some good reasons.

Mr. BENSON said that he was of opinion that the Company had no right to alter the rates without giving proper and sufficient notice to their customers; but, at the same time, the complainant's rate was due in September, and he ought to have tendered it at that time. Instead of that, he allowed his rate to be unpaid until a few days prior to another quarter being due; therefore, he did not consider the complainant could enforce the penal clauses of the Act. The summons would be dismissed.

Mr. WHEELER said that he should consult his client whether it would be advisable to take a case for the decision of the Court above, as it was of the utmost importance to manufacturers and tradesmen.

#### GREENWICH POLICE COURT.—FRIDAY, APRIL 12.

(Before Mr. SLADE.)

##### ILLEGAL CONNECTION OF A METER.

Thomas Smith, of 9, Park Place, Lee Road, Blackheath, gas-fitter, appeared to a summons at the instance of the Phoenix Gas Company, charging him with an infringement of the Act 34 & 35 Vict., cap. 44, in connecting a pipe with the meter of the Company, after it had been previously disconnected by the Company, without giving 24 hours previous notice.

It appeared that, on the 28th ult., owing to the amount due at Christmas for gas consumed not having been paid, the Company disconnected the supply-pipe to the meter. The defendant, however, reconnected the pipe, and used the gas, the Company's officer afterwards paying a visit to the premises, when the pipe was again disconnected in such a manner that it could be replaced.

Mr. CANTAR, on the part of the defendant, who pleaded guilty, said that no fraud was intended, and that defendant had paid the money due after the disconnection was first made by the Company. On the cards used by consumers, there was a printed notice cautioning consumers

against disconnecting pipes from meters, but not against connecting, and defendant thought there was no harm in making the connection.

Mr. ALLEN, who represented the Company, said complaints against consumers were so numerous that it was felt necessary to take proceedings in the present case, so that it should be generally known what the law was. The summons had been taken out under the General Act, the penalty for the offence charged being 40s., but under the Company's Special Act, a summons might have been issued where the penalty was £5, and 40s. for each day such unauthorized consumption of gas took place.

Mr. SLADE said that the defendant, being a gas-fitter, ought to have known what the law was, and a fine of 20s., and 2s. costs, was imposed.

## Miscellaneous News.

### METROPOLIS GAS SUPPLY.

ABSTRACT OF THE QUARTERLY REPORT OF THE CHIEF GAS EXAMINER.—Professor Williamson, F.R.S., has issued his report on the gas supply of the Metropolis, for the quarter ending the 31st of March, 1878. The illuminating power of the gas supplied by the various Companies has been above the standard required by the Acts of Parliament. The average for the quarter has been as follows:—The Gaslight and Coke Company: Beckton, 16.6; Friendly Place, 16.9; Millbank Street (cannel gas), 21.5; Devon's Road, 17.8; Carlyle Square, 17.5; Camden Street, 16.8; Graham Road, 17.5; Ladbroke Grove Road, 17.5. South Metropolitan Gaslight Company: Hill Street, Peckham, 16.8. Sulphuretted hydrogen has not been present in the gas at any of the stations. The proportions of sulphur in other forms have been within the requirements of the Acts of Parliament, with the exception of a slight excess on one occasion at Beckton, North Woolwich, while the average at all the stations has been considerably below the maximum. The averages are as follow:—The Gaslight and Coke Company: Beckton, 11.6; Friendly Place, 11.2; Millbank Street, 16.6; Devon's Road, 10.4; Carlyle Square, 14.7; Camden Street, 16.1; Graham Road, 15.2; Ladbroke Grove Road, 12.3. South Metropolitan Gaslight Company: Hill Street, Peckham, 15.8. Traces of ammonia have been discovered in the gas at most of the stations; in no instance was the parliamentary maximum reached. The stations of the Commercial Gas Company at Wellclose Square and Parnell Road have been closed during the quarter, for repairs.

CAMBERWELL VESTRY.—At the meeting on Wednesday last, the Finance Committee reported the receipt of a letter from the South Metropolitan Gas Company, stating that the Company had reduced the price of gas, from Christmas last, to 3s. per 1000 feet, and had made a reduction in the charge for public lamps from £4 5s. to £3 19s. per lamp per annum, with a discount of 5 per cent. for payment within one month from the quarter, in lieu of the 7½ per cent. hitherto allowed. Mr. Colegrave moved the adoption of the report, which was seconded by Mr. Kemp, who said he thought the Vestry ought to acknowledge, with thanks, the communication from the Company. The report was adopted.

### METROPOLIS WATER SUPPLY.

#### METROPOLIS WATER-WORKS (PURCHASE) BILL.

On Thursday last a deputation from the several Boards of Directors of the Metropolitan Water Companies waited upon the Home Secretary (the Right Hon. R. A. Cross) to urge upon the Government the importance of refusing to permit the Metropolitan Board of Works Bill for the Purchase of the Water Companies of London to be read a second time, or to allow the order for its second reading to be discharged, and of the whole question of the Water Supply of London being referred to a Select Committee. The deputation was introduced by Mr. Samuda, M.P., and there were also present, among others, Mr. Coope, M.P., Mr. Crawford, M.P., Sir Harcourt Johnstone, M.P., Lord Calthorpe, M.P., and Mr. Young, M.P.

Mr. SAMUDA, addressing Mr. Cross, said: I have the honour to introduce this deputation, which consists of the Chairmen and Directors of the principal London Water Companies, and their coming to you has resulted from a question that was put to you in the House of Commons by Mr. Fawcett the other night, when the Metropolis Water-Works (Purchase) Bill was called on. I had left the House at that moment; but it appears to me that the object of Mr. Fawcett in putting that question was to seek your interference and your assistance to enable the second reading of the Bill to be dispensed with, and to pass the Bill directly into Committee, as though it were an accepted condition on your part that the second reading was a mere *pro forma* matter, and that the only matter to be discussed was that which would be duly and properly considered in Committee.

Mr. CROSS: I do not think that was the object of his question—I am sure it was not.

Mr. SAMUDA: I am happy, sir, to hear you say that; but they considered it so. Now, if such a proposition as is involved in this Bill had been brought forward from Manchester, Birmingham, or any of the large towns, it would have been of necessity in a private Bill, which would not be opposed in the manner in which this Bill has been, and an inquiry would have taken place in Committee upstairs. I believe if there was a private Bill for such a purpose, the feeling of the House would be not to reject it on second reading, but send the Bill upstairs. Mr. Fawcett says: "I would therefore ask the Home Secretary now or on any future occasion that he may prefer, whether he sees any objection to the order for the second reading of this Bill being discharged, and to the appointment of a Select Committee to inquire into the subject."

Mr. CROSS: The last part is quite right.

Mr. SAMUDA: That is evidently what he meant. The answer you gave exactly coincides with what we think would be the right thing—what ordeal this question should be submitted to.

Mr. CROSS: Would you remind me of what I did say?

Mr. SAMUDA: You said: "I am quite aware that this measure has given rise to considerable discussion as to the question of purchasing the sources of water supply for London. That is a very practical question. I should have liked well enough to have had this Bill discussed on the second reading, because there are two questions to be considered of considerable importance in regard to these Water Companies—(1) Whether it is wise that the Water Companies should all be placed under one management (that question came, to a very large extent, before a Committee of the House of Commons which sat not long ago); and (2) Whether, if such an amalgamation is desirable for London, the Metropolitan Board of Works is the proper authority under whom the undertakings ought to be placed."

Mr. CROSS: That is perfectly right.

Mr. SAMUDA: Now we think there is a very great public question involved in this matter, and that, unless a public benefit has been proved to exist, there is no justification for taking the unusual course of depriving the whole of these Companies of the position they stand in, at the present moment by reason of privileges obtained by them from Parliament. They urge, and urge I think indisputably, that they have submitted themselves in every possible way to the Legislature; that they have allowed themselves,



with great satisfaction to themselves, to be brought under the authority of the Local Government Board; and that the Local Government Board have, under the Consolidation Water Acts, taken such course as they conceived to be necessary in the interests of the public. Hence demands have been made upon the Companies, which have been freely submitted to by them, and the result is that all the Committees and the Commissions that have been appointed over a large number of years, although they have had constantly brought before them the desire of different public bodies to usurp the authority which these Companies possess, have always come to the conclusion that the duty which is performed by those Companies has been well performed, that the quantity and quality of the water they have supplied have been unexceptionable, and that no change in the source of supply is advisable. This is an extraordinary point, but it has been reported on, on more occasions than one—both by the Committee of 1867, of which Mr. Slater-Booth and Mr. Ayrton were members, and also by the Commission over which the Duke of Richmond presided—that it appeared to them, although they had no end of proposals submitted to them, that none of these changes would be in the public interest. Under these circumstances, it is not unreasonable that persons charged with this great work should think themselves much more capable of performing it than the Metropolitan Board of Works; and they say, "Before you submit us to the great expense which appearing before a Committee would bring upon us, you should see that some public result would accrue from such an inquiry." Sir, I hold that there is no public benefit to result from it. First, it appears to me that it is impossible the Metropolitan Board of Works could dispense with any portion of the professional labour which at the present time is employed in giving this most efficient water supply to London. To do otherwise, if they are to set themselves up as a united authority to take the work into their own hands, it would be done much worse than, without their interference, it has been done. Then, in addition, I would point out that the purchase of these works by the Metropolitan Board would result in an annual charge to the ratepayers, equal to the gross amount which is paid in the Metropolis at the present moment, and that, consequently, the public would be subjected to a higher rate for their water than they now pay. Such being the case, it does appear to me, without going further into the matter, that there is a function of the House of Commons to be exercised before the Legislature will consent to hand over these undertakings to the Metropolitan Board—viz., to determine whether the promoters of this Bill can disprove these facts, and also whether they can show that any public benefit will result from the adoption of the plan they propose. I do not want to go into the details of the matter; I want the deputation to have the opportunity of speaking for themselves, and I believe they propose to do so through Mr. Baxter, their parliamentary agent. With these few observations I would impress upon you that it does appear to me there is a great principle which ought not to be passed over very easily—and that is, whether there is not a public demand that the Bill should have a fair discussion, and that the decision should be arrived at on the principle of the Bill, altogether apart from the details of the manner in which the Board want to make the purchase, and the advantages which would accrue if it were made. I do not refer much to the Committee, as proposed by Mr. Fawcett, because I take it for granted such a Committee would be perfectly inadmissible, and that if it was obtained at all, it would be such a Committee as would be chosen after the Bill had passed a second reading.

Mr. BAXTER: Sir, Mr. Fawcett's proposition was that there should be a Select Committee. He wanted to take it out of the purview of the regular Committee. He says: "There is no chance of the second reading; let us have a Select Committee to decide two things—first, whether it is expedient to buy; and, secondly, whether the Metropolitan Board are the people who ought to be the purchasers." We looked at that. We did not know whether it would be a Committee appointed by the Committee of Selection; we presumed it would be by the House, and if by the House, it would be in the hands of a Select Committee, and, therefore, very great alarm was felt by the Water Companies. Their undertakings are, as the Metropolitan Board have acknowledged, of the value of some 25 millions of money; the Companies represent themselves as of the value of 30 millions. It is a question, therefore, of property; and the interference with that property, and the rights which are held by the Companies in that property is, and ought to be, a matter of very serious and considerate examination, and not one to be interfered with by a Select Committee, or any other process of the House that is not in the regular course of their administration of justice. We have here 25 or 30 millions worth of property to be disposed of. Now, this is property which has been acquired under parliamentary powers; there is not a Company who have not parliamentary powers. Parliament have settled the capital, settled the terms on which and for which it was created, and the remuneration to which it shall be entitled; and, in 1852, a Committee of Parliament sat most solemnly and inquired into all the processes of the water supplies in London. Again, in 1871, they went into the same question, and laid down regulations to secure the quality of the water and the abundance of the supply, so that it has been a matter fully authorized by parliamentary sanction. What the Board of Works ask is a most serious thing: They ask to take the property of the Water Companies into their own hands. There is a population, not connected with the metropolitan districts in any way, of upwards of 600,000 supplied by these Companies, and the Board are now asking that they might have power to supply water to these large areas upon the terms upon which the Companies are now supplying them. We say particularly that Parliament have laid down the rule that they will not allow any public body to buy out compulsorily a private enterprise, unless the terms are first agreed upon. We held that principle on the two former occasions, when Bills were being brought in. We opposed them on the second reading, and on each occasion, at intervals of three or four years, the compulsory powers were withdrawn before the Bills were read a second time. Parliament have thought it right to fence round property of this description to the extent that a public body shall not take it unless they first agree upon the terms. I was concerned for all the Telegraph Companies when these Companies were purchased, and one of the Post Office authorities came to me to say that he was about to bring in a Bill to acquire their undertakings. I said, "You cannot take them by compulsion." He maintained he could, but I told him, "Until you consent to treat with us, we shall have nothing to say to you; you had better consult your parliamentary agent." In a few days I had a letter from him, saying he would be glad to see me again, and admitted that the principle I laid down was right. In that case the terms were all agreed to before the Bill was brought in to purchase. So with other cases in which it has been proposed to acquire gas and water undertakings, the terms have always been agreed to in the first instance, and what we humbly contend for is this: It is the principle of Parliament never to suffer a public body to take compulsory powers to buy up a company unless they come to an agreement as to the price; therefore, we say this Bill ought not to be read a second time, because that principle is involved in it. The Metropolitan Board have announced, by the report of their Engineers, what they intend to do. They say, "We shall have to pay 25 millions to acquire the Companies, and then we shall have to supplement that by a further, and perhaps an almost equal outlay, to replace

the water we buy by other water derived from purer sources." They contemplate, therefore, an outlay of 50 millions of money in acquiring the control of the London water supply. The total gross income of all the Companies is a little over £1,200,000, and if they buy us out at 30 millions, as they can only raise their money at about 4 per cent., the interest on the money would be equal to the gross income of the Water Companies. But out of that gross income, the Water Companies have very nearly half a million to pay for working expenses, so that you see the public would gain nothing; but, on the contrary, would have to submit to an extension of the rates, and of the burden that now lies upon them. There is another difficulty that occurs in connection with the proposal of the Board to buy up the Companies. The payment for water varies exceedingly at present in the different districts. The average charge per head of the population for the whole Metropolis is 6s. 6d. The East London district, from there being a cheaper class of property there, only pays 4s. 6d. per head per annum, while Chelsea pays 8s. 6d., and if the Board's proposal were taken the payment would be, upon an average, 10s. 6d. instead of 8s. 6d. per annum. It would be difficult to preserve those distinctive charges, which arise from the peculiar circumstances of each case, and from the management of the particular Company who have the control of the water supply in each district. The Board say a great sum will be saved by them in the management. The only sum that can be reduced is the Directors' salaries, which are limited to £15,000 a year, and saving £15,000, out of working expenses of £500,000, I will not say a word about; in fact, there cannot be any economy arise. They will require the same turncocks, officers, engineers, and superintendents, whether the works are in one hand or in many hands, and that management will have to be divided into as many parts as there are now Companies. Then I may add that the Board's proposal is extremely unpopular. Their districts are in rebellion against them. The St. Pancras Vestry, and other Vestries and District Boards, condemn the course the Board are pursuing. We, therefore, particularly press upon you that, if there is to be an inquiry, the matter is so important, both to the individual owners of the property, and to the public whom they supply with water, that it ought to be one of the most formal character, and that the proceedings of the House should be strictly adopted, and fenced by the rules they have laid down by themselves; that this Bill ought not to be allowed to go to the second reading without the terms being first agreed upon; and that if the promoters will not take the trouble to agree with the parties as to terms, they should not be entitled to go before Parliament with their scheme. They have never made any proposal, or attempted to negotiate terms with us in any way whatever, and we say that no public or private good would accrue, nor would the regular forms of Parliament be observed if this were remitted to any tribunal but to the regular Committee of Inquiry, until after the terms are agreed upon. I may mention, before I conclude, that I understand the Metropolitan Board of Works have stopped all proceedings upon their other Bill. They have not withdrawn it, but they were getting up evidence, and getting the machinery ready for proving their case. They have stopped that, and told the parties to incur no further expense or take any further steps, so that they seem to put the issue upon this Bill. We, therefore, earnestly press upon you that the House should not let this Bill go to a second reading, and much less should a matter so important be referred to a bye-committee—if I may call it such—a Select Committee which would only inquire into the principle whether the water supply of London should be in the hands of one Company instead of the existing Companies, or whether the Metropolitan Board, or any other central body, should be the parties to hold the interests of those Companies. The Metropolitan Board is evidently an institution *in transitu*; they are not a Metropolitan Authority, as taking in the whole of the Metropolis. There are debates every session as to what shall be the future central authority; the Board are not recognized as a permanent central authority, and it would be anomalous to clothe such a body with the absolute control of property valued at 25 or 30 millions of money.

Mr. CROSS: I was not quite aware of the nature of the deputation, or I should have had the President of the Local Government Board present. It is impossible for me to speak as to this matter. I understood—but I do not like speaking of other people—that the object Mr. Fawcett had in asking me a question the other evening was rather with the view of seeing whether some stop could not be put to the agitation in this matter one way or the other; because every one will allow it is a matter fraught with manifest evils to which I need not allude—that the question of the purchase of Companies of this kind should be always hanging over the public. I do not want to commit Mr. Fawcett in any way, especially in his absence, but I rather understood that was the motive he had in putting the question to me—whether there might be some practical end put to the question one way or other. I hope I am not mis-stating it.

Mr. SAMUDA: I think, sir, you are quite right. I think you have in your mind what he said in the early part of this question. He speaks about the very thing you are speaking about.

Mr. CROSS: I think that is practically the effect of it. I have had other deputations to me on this question. I had a deputation some time ago relative to the increased charges for water which were being made by the Companies in certain parts of London, the complaint practically being that this increase might be with a view to the ultimate purchase of the undertakings. It is desirable, therefore, for everybody that this question should be set at rest. My simple answer—and the only one I can give to you—is, that I promise before Mr. Fawcett puts the question formally in the House on Monday, that I will consult my colleagues—the President of the Local Government Board and the Chancellor of the Exchequer—as to what answer I shall give. I have not had an opportunity of speaking to them, and I cannot give you an answer to-day. There is not the slightest chance, I think, of the Metropolitan Board of Works Bill being read a second time, or coming on for discussion.

Mr. SAMUDA: I understand it is put down for discussion for the 9th of May. It is a long time, but I hope, sir, you will not think the Water Companies have done wrong in coming to you.

Mr. CROSS: Oh, no; I am happy to see them.

Mr. SAMUDA: Sir, in answer to what you have said, I had the honour of introducing a deputation to the President of the Local Government Board on this question. He went rather fully, and I think rather favourably into it, and his general views on this matter are in their interest. The Companies only requested me to address these remarks to you inasmuch as the question has been put to you, and inasmuch as they wished to fortify you with their views on the matter before you gave an answer to this question.

Mr. CROSS: Perfectly right.

The deputation then withdrew.

WATER GAS IN AMERICA.—The *Polytechnic Review* says: "The local water-gas system lately condemned by the Trustees of the Philadelphia Gas-Works, has been introduced on a much larger scale in Baltimore. The new works have a capacity of producing 1 million cubic feet daily, and the foundations for a plant of equal capacity are laid to meet a probable increase of demand. The Baltimore works will, no doubt, definitely settle the question of the merits of the local system."



**SOUTH METROPOLITAN GAS COMPANY.**  
The Ordinary Half-Yearly General Meeting of the Proprietors of this Company was held at the Bridge House Hotel, London Bridge, on Monday, the 8th inst.—Captain HEATHORN, R.A., in the absence of Mr. Simpson, the Chairman, through indisposition, presiding. The following report and accounts were taken as read:—  
The past half year has been one of such uniform prosperity that the Directors have but little to present to the Proprietors in the shape of a report.  
There has been a moderate increase in the consumption of gas, which, coupled with comparatively low prices for coals, &c., has resulted in a profit sufficient to maintain the

11 per cent. dividend, to add 1 per cent. to the insurance-fund, and to carry forward a balance to the next half year.  
The Directors have reduced the price of gas to 3s. per 1000 feet from Christmas last.  
By the Company's Act of Incorporation, one Director retires from office at this meeting, and also one Auditor.  
The Director who retires is B. Drew, Esq., who, owing to advanced age, does not offer himself for re-election.  
The Auditor who retires is F. Simpson, Esq., who, being eligible, offers himself for re-election.  
R. Foster, Esq., has resigned the office of Auditor.

No. 1.—STATEMENT OF SHARE CAPITAL on Dec. 31, 1877

Acts of Parliament authorizing the Raising of Capital.	Description of Capital.	Standard Dividend.	Number of Shares issued.	Nominal Amount of Shares.	Called up per Share.	Total paid up.	Amount not paid up.	Total Amount authorized.
5 Vict., cap. 79 . . . . .	Share.	10 per cent.	4,000	£50 0 0	£30 0 0	£200,000 0 0	..	£200,000 0 0
32 & 33 Vict., cap. 130 . . . . .	Do.	Do.	1,000	12 10 0	12 10 0	50,000 0 0	..	50,000 0 0
39 & 40 Vict., cap. 229 . . . . .	Do.	Do.	20,000	12 10 0	11 10 0	230,000 0 0	£20,000 0 0	250,000 0 0
						£180,000 0 0	£270,000 0 0	£750,000 0 0

No. 2.—STATEMENT OF LOAN CAPITAL.

Acts of Parliament authorizing Loan Capital.	Description of Loan.	Rate per Cent. of Interest.	Total Amount Borrowed.	Remaining to be Borrowed.	Total Amount Authorized.
32 & 33 Vict., cap. 130. . . . .	..	Not exceeding 5 per Cent.	Nil.	£62,500	£62,500 0 0
39 & 40 Vict., cap. 229 . . . . .	..	Ditto.	Nil.	187,500	187,500 0 0
				£250,000	£250,000 0 0

No. 3.—CAPITAL ACCOUNT.						
Dr.		Description of Capital.		Certified to June 30, 1877.	Received since that Date.	Total to Dec. 31, 1877.
To Expenditure to June 30, 1877. . . . .		£413,899 15 11				
Expenditure during half year to Dec. 31, 1877, viz.—						
New buildings and machinery in extension of works . . . . .		£10,829 18 3				
New and additional mains and services . . . . .		2,786 12 3				
New and additional meters . . . . .		1,023 18 9				
		11,640 9 8				
Total expenditure . . . . .		£433,540 5 7				
Balance . . . . .		21,459 14 5				
		£480,000 0 0		£150,000 0 0	£20,000 0 0	£480,000 0 0

No. 4.—REVENUE ACCOUNT, for the Half Year ended Dec. 31, 1877.

To Manufacture of gas—				By Sale of gas—			
Coals, including dues, carriage, unloading and trimming. (See Account No. 9). . . . .				Common gas (per meter) at 3s. 2d. per 1000 cubic feet . . . . .			
Purification, including £888 5s. 1d. for labour . . . . .				Less discount . . . . .			
Salaries of Engineer, Superintendent, and Officers at works . . . . .				Public lighting and under contracts (see Statement No. 11) . . . . .			
Wages (carbonizing) . . . . .				Rental of meters . . . . .			
Repairs and maintenance of works and plant, materials, and labour—less £204 5s. 3d. received for old materials . . . . .				Residual products—			
				Coke, less £1002 11s. 1d. for labour and cartage. . . . .			
				Breeze, less £156 8s. 3d. for labour and cartage. . . . .			
				Tar . . . . .			
				Ammoniacal liquor . . . . .			
Distribution of gas—				Rents receivable . . . . .			
Repair, maintenance, and renewal of mains and service-pipes, including labour . . . . .				Transfer fees . . . . .			
Salaries and wages of officers (including rental clerks) . . . . .							
Repairing and renewals of meters . . . . .							
Public lamps—							
Lighting and repairing . . . . .							
Rents, rates, and taxes—							
Rents payable . . . . .							
Rates and taxes . . . . .							
Management—							
Directors allowance . . . . .							
Salaries of Secretary and Clerks . . . . .							
Collectors commission . . . . .							
Stationery and printing . . . . .							
General charges . . . . .							
Company's Auditors . . . . .							
Law charges . . . . .							
Bad debts . . . . .							
Superannuation-fund . . . . .							
Gas Referees and Official Auditor . . . . .							
Total expenditure . . . . .							
Balance carried to net revenue account, No. 5 . . . . .							

No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on deposits . . . . .	£53 2 10	Balance from last account . . . . .	£37,219 17 4
Amount carried to insurance-fund . . . . .	1,800 0 0	Less dividend on ordinary capital for the half year ending June 30, 1877 . . . . .	25,300 0 0
Amount carried to reserve-fund . . . . .	318 2 4		£11,919 17 4
Balance applicable to dividend on ordinary share capital . . . . .	30,432 7 3	Amount from revenue account, No. 4 . . . . .	32,515 5 8
		Interest on monies on deposit . . . . .	168 9 5
	£44,603 12 5		£14,603 12 5

No. 6.—RESERVE-FUND.

Balance on Dec. 31, 1877 . . . . .	£20,636 4 8	Balance on June 30, 1877 . . . . .	£20,600 0 0
		Amount brought from net revenue account . . . . .	318 2 4
		Half year's interest . . . . .	318 2 4
	£20,636 4 8		£20,636 4 8

No. 9.—STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1877.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, Dec. 31, 1877.
Newcastle coal . . . . .	Tons. 6,608	Tons. 58,231	Tons. 50,721	Tons. 227	Tons. 13,891
Cannel coal . . . . .	1,168	1,811	1,382	227	1,397
	7,776	60,042	52,103	227	15,488

No. 7.—RENEWAL-FUND (LEASEHOLD).

Balance on Dec. 31, 1877 . . . . .	£10,236 16 3	Balance on June 30, 1877 . . . . .	£10,076 5 1
		Interest on amount invested . . . . .	160 11 2
	£10,236 16 3		£10,236 16 3

No. 8.—INSURANCE-FUND.

Balance on Dec. 31, 1877 . . . . .	£7,894 16 8	Balance on June 30, 1877 . . . . .	£3,047 10 2
		Interest on amount invested . . . . .	47 6 6
		Amount brought from net revenue account . . . . .	4,800 0 0
	£7,894 16 8		£7,894 16 8

No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

	In Store, June 30, 1877.	Made during Half Year (estimated.)	Used in the Half Year (estimated.)	Sold in the Half Year.	In Store, Dec. 31, 1877.
Coke . Chaldrons of 36 bushels. . . . .	115	51,642	17,686	30,493	3,578
Breeze do. 36 do. . . . .	67	2,672	..	2,429	310
Tar . Gallons . . . . .	8,775	478,553	1,500	446,006	30,822
Ammoniacal liquor—Butts of 108 gallons, 10-oz. strength. . . . .	852	11,073	..	9,151	2,774



No. 11.—STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity made, partly measured in Gasholders.	QUANTITY SOLD.			Quantity used on Works, &c., partly estimated.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common . . . . .	494,474	42,579	419,712	462,291	4,500	466,791	27,683	4,055

No. 12.—BALANCE-SHEET.

To Capital—	By Cash at bankers	£6,835 18 8
For balance, per account No. 3 . . . . .	Amount invested in Three per Cent. Consols—	
Reserve-fund, per account No. 6 . . . . .	Reserve-fund . . . . .	£20,000 0 0
Renewal-fund, per account No. 7 . . . . .	Renewal-fund . . . . .	10,236 16 3
Insurance-fund, per account No. 8 . . . . .	Insurance-fund . . . . .	3,091 16 8
Net revenue account—		33,331 12 11
For balance, per account No. 5 . . . . .	Cash in hand for freight, accounts, &c. . . . .	1,000 0 0
Sundry tradesmen, for amount due for coals, stores, and sundries . . . . .	Stores in hand—	
Deposits by consumers . . . . .	Coals . . . . .	£13,072 2 10
Property-tax account . . . . .	Coke and breeze . . . . .	1,691 8 0
	Tar and ammoniacal liquor . . . . .	1,529 3 3
	Sundry stores . . . . .	2,663 1 2
		18,955 15 3
	Accounts due to the Company—	
	Gas and meter rental, quarter ending Dec. 31, 1877	£49,643 6 3
	Arrears outstanding . . . . .	700 6 7
		50,343 12 10
	For coke and other residual products . . . . .	2,031 8 0
	Sundries . . . . .	401 11 11
	Interest . . . . .	318 2 4
		£113,218 1 11
		£113,218 1 11

On the motion of the CHAIRMAN, seconded by Mr. HILL, the report and accounts were received, adopted, and entered on the minutes.

The CHAIRMAN then moved—"That a dividend at the rate of 11 per cent. per annum, for the half year ending the 31st of December last, be now declared and made payable on the 9th inst., and that the warrants be transmitted to the Proprietors by post."

Mr. JENKINS seconded the motion, which was carried.

The CHAIRMAN said he was sorry to announce, and the Shareholders would be all sorry to hear, that Mr. Drew, the Deputy-Chairman, had resigned. He was one of the oldest of the Directors, was in every way a perfectly kind friend to all the members of the Board, and his good temper and pleasant bearing always had a great effect in keeping everything together. He concluded by moving a resolution expressing regret at the resignation of Mr. Drew, and, at the same time, wishing him every prosperity in the future.

Mr. HILL, in seconding the motion, said he did so with a profound feeling of sorrow. Mr. Drew had been on the Board long before he (Mr. Hill) had been, but since they first met in an official capacity they had ever been on intimate relationship. Mr. Drew had always had the interests of the Shareholders at heart, and at the Board had conducted himself in a quiet and gentlemanly way. He was sure they would all feel regret at Mr. Drew's resignation, and that they would cordially agree to the motion proposed by the Chairman.

The motion was put to the meeting, and carried unanimously.

Mr. ROSTON proposed that Mr. Richard Foster, one of the Auditors, be elected a Director of the Company in room of Mr. Drew. The difficulty he had in speaking of Mr. Foster's merits consisted in the abundance of material he had to deal with. He believed that, as in Mr. Drew's case, Mr. Foster and his family had been connected with the Company from the very commencement. Although their first Act of Parliament was passed in 1842, the Company were formed some eight years previously, and among those gentlemen who formed themselves into an association for the purpose of lighting certain southern parishes with gas, under the title of the South Metropolitan Gas and Coke Company, he thought no less than seven were members of Mr. Foster's family. Of course the Shareholders had latterly been so accustomed to receive a dividend of 10 and 11 per cent. that it was difficult to believe that at one time the Company were a non-dividend paying concern; but such, he understood, was the fact.

The SECRETARY: For a short time.

Mr. ROSTON said during the first seven or eight years of the Company's existence, he believed, there were many difficulties to contend with, amongst which there was a very serious explosion; but it was fortunate that they then had for a Chairman, Mr. Foster, uncle of the present nominee. He was a gentleman who possessed great energy and ability, and had full confidence in the Company. He battled with these former hard times, and guided the Company safely through them, and that in a way and to an extent which he (Mr. Roston) thought no other person would have been found to do. Were it, therefore, on the score of gratitude alone, he thought he might confidently ask the vote of every Shareholder on behalf of Mr. Foster. But, apart from that, he had greater claims on their consideration. He had been a proprietor ever since 1836, and was at present, he believed, the largest Shareholder. He thought he was also correct in stating that Mr. Foster had never parted with any of his shares. He was a gentleman possessing a great knowledge of business, and would be able to give to the Company some leisure time; and, having been Auditor, must thoroughly know the accounts. In electing him to the post of Director, the Shareholders would have every guarantee that he would be the right man in the right place, and he felt assured that the Directors would welcome him as a colleague.

Mr. HARRISON seconded the motion. For upwards of 35 years he had known the eminent firm with which Mr. Foster was connected, was personally acquainted with him, and had had ample opportunity of forming an estimate of his character. He was sure that Mr. Foster's large commercial experience, and his high standing in the City of London, must be an acquisition of strength, not only to the Board, but also to the general position of the Company.

The motion was carried unanimously.

Mr. FOSTER, in returning thanks, said that, as far as his abilities would allow him, he should be very happy to do his best to continue the prosperity of the Company. He was, probably, the oldest Shareholder in the room. Looking over some old papers, he saw among them a certificate of some shares registered in his name in the year 1836. The present position of the Company was certainly most gratifying, and he could only hope that the electric light, and all such modern inventions, would do nothing to prevent them continuing to flourish. From what he had seen and heard, he believed that the gas supplied to private customers was the great source of the Company's income, and that it would continue to be so for many years. Nothing was more simple than for people to put a light to their gas; they did not want electricity in their houses. He thought the Company were really in a prosperous condition, built up in a great measure by the past generation. In conclusion, he expressed regret at the absence of the Chairman, through illness. He had presided over many meetings, but age was creeping upon him, as also upon Mr. Drew, who

had just resigned his office; and, in the natural course of events, as the Directors grew older, they must make room for younger men.

On the motion of Mr. DONKIN, seconded by Mr. MALTBY, Mr. F. Simpson was re-elected Auditor; and, on the motion of Mr. T. R. HILL, seconded by Mr. HEARNE, Mr. A. Footner was elected Auditor, in room of Mr. Foster.

Mr. SIMPSON, in returning thanks for his re-election, said it was always a great pleasure to him to audit the accounts, which were not only admirably kept, but showed the wisdom, care, and watchfulness of the Directors, and the great energy and skill of the Secretary. He also took occasion to congratulate the Shareholders on the selection they had made of Mr. Foster as a Director, although he could not but regret the loss of so able a colleague. Considering that the Company sold the best and cheapest gas in the Metropolis, and realized 11 per cent., it would be admitted that the Directors were the right men in the right place.

Mr. FOOTNER also thanked the meeting for the compliment that had been paid him in electing him as Auditor.

Mr. BUTLER said he wished to move a resolution. The Directors had been complimented on former occasions for their ability, but the thanks of the Shareholders had never taken a substantial form. Considering that the Company supplied gas so cheaply, and that they had now a capital of £500,000 instead of £250,000, of course there must be a great increase of work, and also an increase of anxiety, and if the Shareholders looked forward to having a certain class of gentlemen on the Board, he thought the Directors ought to be remunerated in proportion, at least, to those of other Companies. Though a few other Companies were charging less than 3s. for their gas, he did not think any other Company were paying 11 per cent.

The SECRETARY said there was one—the Croydon Company—who for one half year paid a little more. But their standard price was 4s. 7d. per 1000 feet.

Mr. BUTLER said that would, of course, account for it. He begged to move—"That the remuneration of the Directors be increased from £1200 to £1800 a year, on condition that the Directors be immediately increased to six." It was thought by some that there was a minimum number of Directors on the Board, and he therefore moved that there should be one additional. The sum proposed would give £300 a year to each of the Directors, which would correspond with the amount of the fees given by the Commercial and other Companies. The Commercial divided £3200 a year between ten. That was £320 each, which was in excess of what he was now proposing; the Phoenix divided £3000 a year between ten, or £300 a year; the London divided £2150 a year between eight, which was £269 each; the Directors of the Surrey Consumers received about £250 each; and the South Metropolitan had hitherto given their Directors £240 each, which sum, he believed, was fixed about eleven years ago. The affairs of the Company had, however, materially changed since then, and he hoped the sum he proposed would not be considered excessive. There was no other Gas Company at present with anything like so small a Board. He thought that, seeing the way in which the Directors had performed their duties, the Shareholders would have no hesitation in passing the resolution unanimously.

Mr. DOCWRA seconded the motion.

Mr. HOBSON did not wish to oppose the allowance, but he should like to have another Director added, which would make seven instead of six. He had been 26 years on the Board of a provincial Company where there were twelve Directors, and the rental and the consumption of coal was very much the same as that of the South Metropolitan Company. He should not object to £2000 being voted if seven Directors were agreed upon.

Mr. BUTLER observed that the Phoenix had only ten Directors, with a capital almost double that of the South Metropolitan. He thought six Directors would be sufficient.

Mr. HOBSON maintained that the position of the Company would be strengthened if they had seven Directors instead of six.

The CHAIRMAN suggested that a trial should be made of six, and if these were found insufficient, another could be added at some future time.

After some further conversation,

The CHAIRMAN put Mr. Butler's motion, which was carried unanimously.

Mr. JENKINS (one of the Directors) said he had looked at the Act of Parliament to see whether the meeting had power to elect an additional number of Directors, because by the Act of 1842, five gentlemen were named as Directors, and provision was made for their going out of office by rotation, and for the re-election of themselves or the election of others in their place in the event of death, or their otherwise becoming disqualified from holding office. It certainly did seem to him a hard thing that a Company should not have the power of increasing their number of Directors if they thought proper, but there was this difficulty. He did not see in the old Act, nor in the Acts of 1869 or 1876, or in the Companies Clauses Act, any provision made to give power to the Company to increase the number of Directors; therefore, the resolution which had been passed ought to be accepted subject to the power of the Shareholders to increase the number. It would be the duty of the Secretary to take the advice of the Solicitor, who would probably



consult Counsel on the matter. He only offered these observations with the view to preventing the Shareholders doing anything which was not strictly and legally within their province. He was bound to say that nothing could be more gratifying to the Directors than the kind manner and tone in which this matter had been discussed, and he was sure it would be a source of great regret to the Chairman that he was absent on an occasion when so many kind things had been said in regard to the Directors.

Mr. JULIAN HILL said that the Directors would all feel grateful for the resolution that had just been passed. Of course the Company must act within their legal limits, but nobody could say that any injustice would be done in adding to the force that had to work such a great Company.

The CHAIRMAN also returned thanks for the substantial manner in which the Shareholders had expressed their appreciation of the services that had been rendered by the Directors. He was quite sure that it was the wish and purpose of every Director of the Company to do everything that he could for the prosperity of the Company, irrespective of all other interests. The Directors did not pay much attention to other enterprises; they were content to stick to their own concern, and to do the best they could for it.

On the motion of Mr. HOBSON, a vote of thanks was cordially passed to the Secretary and Engineer, and other officers of the Company.

Mr. LIVESY (Secretary and Engineer), in responding to the compliment, said he had always felt himself more in the position of a partner in the concern than of a mere official connected with it. He hoped that the South Metropolitan would continue to maintain, as they had hitherto, the lead of the Metropolitan Gas Companies. The Company were well served by a very efficient staff, and it was necessary for the continuance of the Company's success that such a staff should be maintained.

The proceedings then terminated.

#### SHEFFIELD UNITED GAS COMPANY.

The Half-Yearly Meeting was held on Monday, the 1st inst.—Mr. F. T. MAPPIN in the chair.

The following report was submitted:—

Your Directors have but little to bring before you in the present report, but they have again the pleasure of submitting to you a satisfactory balance-sheet—viz., that for the half year ending Dec. 31, 1877.

The balance in favour of revenue, shown by such balance-sheet (but which includes a sum of £3348 0s. 9d., brought over from the preceding half year), is £38,253 11s. 3d.

Your Directors recommend the payment of the maximum half-yearly dividend, and the carrying forward, to the credit of the half year now current, the balance of £14,817 17s. 11d., which will remain after paying such dividend.

Such dividend will be as under:—

Dividend on £135,000 class A stock, after the rate of 10 per cent. per annum	£6,750 0 0
Dividend on £209,053 10s. class B stock, after the rate of 10 per cent. per annum	10,452 13 6
Dividend on £99,700 class C stock, after the rate of 9 per cent. per annum	4,486 10 0
Dividend on 12,937 new ordinary £10 shares (second issue), £3 per share paid up, after the rate of 9 per cent. per annum, being 2s. 8d. and 2-5ths of a penny per share, or	1,746 9 10½
Total	£23,435 13 4½

The maximum charge for gas (as you will see by the balance-sheet) was, during the half year, 2s. 10d. per 1000 cubic feet. It is now, and since January last has been, only 2s. 9d.

During the half year, amongst other extensions, the mains have been carried forward to the Intake, Hollins End, and Birley Vale, and your Board have now under consideration memorials requesting that they may be laid to Chapelton and High Green.

The gasholder in the new tank at Neepsend, referred to in the last report, has been completed.

Dr.	Capital Account, for the Half Year ending Dec. 31, 1877.				Cr.
Class A stock, fully paid up	£135,000	0	0	Land, buildings, parliamentary, and other expenses,	
Ditto B do.	209,053	10	0	works, and machinery (including mains to June 30, 1855)	£424,928 2 8
Ditto C do.	99,700	0	0	Mains from June 30, 1855	70,804 6 3
12,937 new ordinary £10 shares (2nd issue), £3 per share paid up	38,811	0	0	Meters	30,042 2 1
Amount raised on mortgage	39,400	0	0	Balance	1,762 13 0
Calls paid in advance on new ordinary £10 shares	5,573	0	0		
	£527,537	10	0		£527,537 10 0

#### Revenue Account.

Balance brought from last account	£8,348 0 9	Half year's expenditure in the production of gas	£56,777 7 0
Half year's gas and meter rents, due this day	63,772 2 2	Paid mortgagees & bankers for interest during the half year	597 16 5
Amount arising from the sale of coke, tar, waste lime, and ammonia water	18,264 10 3½	Balance	38,253 11 3½
Amount realized from the manufacture of sulphate of ammonia, sale of gas fittings, and work done (after deducting all charges) and house and other rents	5,244 1 6		£95,628 14 8½
	£95,628 14 8½	Dividends payable April 9, 1878	£23,435 13 4½
		Balance to be carried forward	14,817 17 11

Balance brought down	£38,253 11 3½		£38,253 11 3½
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Maximum price of gas for the half year, 2s. 10d. per 1000 feet.

#### General Balance.

Balance of revenue account	£38,253 11 3½	Ledger balances, and accounts owing to the Company	£37,983 5 3
Ledger balances, and accounts owing by the Company	52,048 17 8	Stores in hand	18,050 15 10½
Balance of capital account	1,762 19 0	Balance due from bankers	16,030 3 7
		Balance due from cashier	1 8 1
	£92,065 7 11½		£92,065 7 11½

Reserve-fund, invested June 30, 1877	£51,958 13 7
Interest to Dec. 31, 1877	873 9 1
	£52,832 2 8

The CHAIRMAN, in moving the adoption of the report, said: Gentlemen. You will find from the report that the balance of profit for the last half year is £29,905 10s. 6d., out of which to pay a dividend of 10 per cent. on the A and B stock, and 9 per cent. on the C stock and the new £10 shares. This absorbs £23,435 13s. 4d., which will leave a balance of profit for the half year of £6469 17s. 2d. This, added to the previous balance of £8348 0s. 9d., will make £14,817 17s. 11d., and this the Directors have carried to the credit of the present half year's account. Our reserve-fund now amounts to £52,832 2s. 8d., and as the highest price that we have charged for gas during the past half year is 2s. 10d. per 1000 feet, we have every reason to be contented with the satisfactory condition of our undertaking. The public, too, I think, have cause to be gratified with the manner in which they are dealt with, for they have had an excellent quality of gas at a very moderate price. The quality has been tested many times, and the tests may be of interest to some of you. In 1876 we made

1811 tests, and the average illuminating power was 16½ sperm candles. In 1877 there were 1707 tests, and the average quality was 16½ candles. The Corporation made the following tests:—In 1876 they made 147, and the average quality was 16½. In 1877 they made 144 tests, and the average quality was 16½. When you consider, gentlemen, that in the tests made of the Sheffield gas, we use the old 15-hole Argand burner, I think you must come to the conclusion that these tests are very satisfactory. If we were permitted to test the gas by Sugg's patent burner, which is introduced into most of the Acts of Parliament relating to gas that have been passed for some years, we should show that the average quality of the gas in 1876 was nearly 18 candles, and in 1877 the standard would be pretty much the same. When we bear in mind that our average quality has been something like that during the last two years, I think the public have every reason to be satisfied. Our leakage has been reduced to a very small amount. The returns show that upon the gas actually made and actually sold there was a loss of 7·80 per cent., and that includes the gas consumed at the different works of the Company. The new gasholder is finished, and the tank is being filled with water. This operation has been going on during the last ten days, and this morning the Engineer reports that there are 12 feet 10 inches of water in it. Thus, so far, we may consider the holder satisfactory. Contracts for coal have lately been made by the Directors, and they are equally favourable as those made on a previous occasion. The governor-house in Bow Street will shortly be replaced by one which is now being built in Pinfold Street. Your Directors made an exchange of 187 yards of land in Bow Street, and are satisfied to take 100 yards in Pinfold Street, so there can be no complaint of the Directors being very hard with public bodies in that respect. After this meeting is over your Directors will meet to transact their ordinary monthly business; but two special questions will be brought before them which may be interesting to you. One, I believe, will be whether we shall be in a position to make a further reduction in the price of gas. The public certainly will not object to that. The other question is to consider the propriety of creating a new stock, so that we may pay off the mortgage debt existing on the Company; and the amount we are talking about—whether it will be decided upon or not, I cannot say—will be £17 for every £100 share. This, I am sure, will be satisfactory to all of you, and as these two questions are coming up for discussion together, I think it will be wise to decide them, if we can, in the affirmative. I do not know that I have anything further to say, but I cannot sit down without expressing my thanks to Mr. Roberts, our very able Manager, for the efficient way in which he conducts the business of the Company. On all occasions, I am happy to say, I find him equal to his duties, and ever ready and willing to afford me information relating to the business of the Company; and not only to myself, but I am sure that is the opinion of the rest of the Board. I have to move—"That the Directors report now read be approved and entered upon the Company's minutes, and that a copy of the resolutions of this meeting be sent to each Shareholder."

Mr. ROPER seconded the resolution.

Mr. WILSON said twelve months ago he made a complaint about the supply of gas in Snighill and Westbar. The matter had to some extent been remedied, for there was now a better supply of gas, but still the supply was not up to the mark. He was of opinion that new mains were wanted in the centre of the town. Not at this time of the year, but in the winter quarter, the supply was deficient from seven to nine o'clock in the evening; and he thought the deficiency could only be remedied by increased mains. The Shareholders had every reason to be satisfied with the report. A little more than 20 years ago the Company were selling gas at 3s. per 1000, feet and yet had no dividend to declare. They were now selling gas at 2s. 10d., were paying 10 per cent., and were getting together a large surplus besides. As Shareholders they were very thankful; and the town ought to be grateful that gas was supplied at such a price as 2s. 9d., and was likely to be cheaper still. He agreed with the proposal to capitalize the mortgage debt. That course had been resorted to in times past, and he thought it should be resorted to again. Not many of the present members of the Board were Directors during the days of the Company's great struggles; but they still had their champion, Mr. Wake, who had carried them through many difficulties. Before now their meetings were crowded, and their proceedings were carried on amidst the greatest excitement. How great was the change! There was no excitement that day. They were all calm enough, and were quietly waiting to receive their dividends. The Gas Company were not like the Water Company, who could not pay a dividend; or like a number of limited companies whose shares were practically worth nothing. Much of the success of the Company he attributed to their excellent Board of Directors, and he thought the Shareholders ought to be very much obliged to them.

The CHAIRMAN said he remembered the complaint made by Mr. Wilson, and thought it had been attended to. He had inquired of Mr. Roberts, the Manager, as to whether there were any more complaints from the neighbourhood of Snighill with regard to a deficient supply, and he informed him that there were none. Sometimes complaints of this kind were made when the shortness of supply arose from local causes, and not from inadequacy of the mains.

The motion for the adoption of the report was put and carried, and the dividends recommended therein were declared.

A vote of thanks to the Chairman terminated the proceedings.

TOTTENHAM AND EDMONTON GAS COMPANY.—At the half-yearly ordinary general meeting, held on Saturday, the 13th inst., the Directors reported that the business of the Company continued satisfactory. The disposable balance of profit was £3625 19s. 7d., out of which the Directors recommended that a dividend be paid at the rate of 10 per cent. per annum on the original capital, and at the rate of 7 per cent. per annum on the new ordinary capital, amounting together to £3199 3s. 1d., leaving a balance of £426 16s. 6d. to be carried to next account. The Engineer reported that the works continue to be maintained in an efficient condition.

FYLDE WATER-WORKS COMPANY.—The half-yearly meeting was held on the 4th inst., at Kirkham—Mr. F. Kemp in the chair. The report of the Directors stated that "the expenditure on capital account during the six months ended the 28th of February, amounted to £9025 10s. 10d., making the total to that date £175,864 12s. The amount received for water in the same period was £6377 14s. 8d., the working expenses and interest £2580 4s. 7d.; leaving a balance of £3797 10s. 1d. The receipts for water during the year exceeded by £1000 16s. 4d. those of the previous year. The number of houses supplied increased in that period from 5725 to 6320. The Directors recommend a dividend for the half year at the rate of 6 per cent. per annum, free of income-tax. The Grizedale puddle trench has been executed to the top of the concrete, and the Engineer and three other professional gentlemen all report their opinion that, in consequence of excavations made for the repair of the reservoir bank in 1868, there had been a set of the puddle towards the opening then made, which eventually caused the leakage of December, 1876. Certain steps recommended by the Engineers for the restoration of the bank are now being carried out. The works at Barnacre have not progressed satisfactorily, but are now near completion."



## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is still only a very limited demand for either coal or iron in this district, with a very keen competition for orders, which causes quotations to be weak and irregular, and the actual selling prices are very difficult to ascertain.

Although a little extra demand for the best classes of round coal has been kept up by the recent cold weather, this description of fuel only moves off slowly, and it is probable that the few days stoppages, which are occasionally resorted to at many of the pits, will result in a pretty general adoption of short time during the summer, if the accumulation of heavy stocks is to be prevented. The gas coal trade is just beginning to stir, and one or two contracts are reported to have been settled, but, as yet, there is nothing doing to materially influence the market. Consumers are endeavouring to take advantage of the present depression in trade to secure as long forward contracts as possible at the low prices now ruling in the market. In some instances deliveries extending over five years are asked for, and in the majority of cases they extend over from one to three years, the preference being given to the colliery proprietors who are willing to tender for the longest period. As, however, the prices which are now being accepted cannot, under any possible circumstances, be remunerative, there is not much probability of coalowners entering into very long forward engagements, and I have heard of very few instances where they are disposed to entertain any contract over twelve months. The prices quoted vary very much according to quality, but there are plenty of extremely low offers in the market, and it must be a very good description of screened gas coal that consumers cannot get at the pit mouth for 8s. per ton, or even less. In cannel it is scarcely possible to give any quotation, as prices vary as much as 10s. per ton, according to quality. In other descriptions of fuel the prices quoted at the pit mouth range about as under:—Best Wigan Arley, 9s. to 10s.; common ditto, 7s. 6d. to 8s.; Pemberton four-feet, 7s. 6d. to 8s.; common coal, 5s. 6d. to 6s. 6d.; burgy, 4s. to 5s.; and slack, 3s. to 4s. per ton.

At one or two pits reductions in colliers wages are being made, but no general action has yet been decided upon.

In the iron trade there is little or no change either as regards prices or demand, and producers both of the raw and finished article in all its branches are very short of orders.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the North of England showed some little improvement last week. The demand for best gas coals was seasonable, and the shipments to the lower ports of the Baltic, to Sweden and Denmark in especial, have been pretty good. The rates are—Best gas, 7s 6d.; medium, 7s.; and inferior from 6s. to 6s. 6d. per ton. Second-class gas coals are not lower in the quotations, for the reason that coals of this description are shipped for manufacturing purposes. There is a stronger inquiry for best steam coals, and a pretty brisk trade has been transacted to the Mediterranean.

There were large arrivals of sailing vessels in the Tyne and Wear last week. Little ships, which had been freighted by the Gas Companies before they left the South, were loaded forthwith. Most of the small vessels which came to hand were chartered also at previous quotations—viz., 5s. to 6s. per ton East Coast; 6s. 9d. the Channel; and 5s. 9d. London. Bricks to London, 6s. 6d. There has been a good deal of excitement in the foreign freight market within the fortnight.

The iron and manufacturing trades of the Tyne and district, with the exception of iron shipbuilding, are very quiet. The shipments to the Continent are limited.

## TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

An extraordinary general meeting of the Shareholders of the Kirkintilloch Gas Company was held on the 1st inst., for the purpose of considering a proposal made by the Police Commissioners of the burgh of Kirkintilloch to purchase the whole works of the Company. After the correspondence with the Commissioners had been read, and the Chairman (Mr. Malcolm Maitland) had fully explained the purpose for which they had been called together, he moved—"That the undertaking of the Kirkintilloch Gas Company, and all the rights, powers, and privileges, and all the lands, premises, works, and other property of the Company, be sold to the said Commissioners on terms to be mutually agreed upon, or to be fixed by arbitration in the manner provided by the Lands Clauses Consolidation (Scotland) Act, 1845." The motion was seconded by ex-Bailie Stephen, and, after a short discussion, unanimously agreed to.

At the last ordinary meeting of the Kirkintilloch Burgh Gas Commissioners a Committee of five members was appointed for the purpose of meeting with the Directors of the Kirkintilloch Gas Company, or any Committee appointed by them, regarding the acquisition of the undertaking of that Company by the Commissioners.

The annual dinner of the Brechin Gaslight Company was held last Wednesday week—ex-Provost Duncan, Chairman of the Company, in the chair—and, in addition to the Directors, there were present a number of the manufacturers of the town and other large consumers. Considerable interest and amusement were afforded by reference to the profits and prospects of the Company, and the likelihood of the gas supply undertaking being taken over by the Municipal Authorities. The prevailing opinion seemed to be that, so long as first-class gas was sold at 5s. per 1000 cubic feet, the Corporation would not make any move to take over the gas-works. It was mentioned that the Company's shares were now selling at £24, the last dividend thereon having been 15s.

At the annual meeting of the Denny Gas Consumers Company a dividend of 7½ per cent. on the ordinary shares was declared, and it was announced that the Directors had reduced the price of the gas from 7s. 1d. to 6s. 8d. per 1000 cubic feet. The Directors specially acknowledged the care and attention bestowed by the Manager, Mr. Scott, on his various duties. A few additional facts may be mentioned regarding the gas affairs of Denny, a town which until very recently could rejoice in having two Gas Companies. Last year a dividend of 5 per cent. was paid by the Gas Consumers Company, the first for 17 years. About two years ago the original £1 shares were selling at 12s. 6d., but their value has since then so much improved that even £1 5s. has lately been refused for them; indeed, it may be mentioned that about five years ago 55 shares were bought for the sum of £5, and sold lately at £1 each. In the year 1875 the price of the gas was 8s. 9d. per 1000 cubic feet, as against 6s. 8d., the price to which it has now been reduced. In the same year the leakage was 32 per cent., and it has now been reduced to something less than 20 per cent.

According to Dr. Wallace's report on the illuminating power of the gas supplied in Glasgow during the week ending the 30th of March, the minimum in the Northern district was down as low as 24.74 candles; and twice during that week the minimum illuminating power was twice under the 25-candle standard in the same district. The maximum in that district during the week was 26.19 candles, and the highest over the week was 28.15 candles, in the western district.

During the week ending April 6, the minimum illuminating power of the Glasgow gas was 26 candles. The average ranged from 26.23 candles to 27.36 candles, the minimum from 26.01 candles to 26.55 candles, and the maximum from 26.49 candles to 28.40 candles.

The Town Council of Dumfries are raising a loan of from £23,000 to £25,000, in order to complete the purchase of the local gas undertaking in accordance with the action lately agreed upon under the Burghs Gas Supply Act.

At the last monthly meeting of the Dundee Gas Commissioners the plans prepared by the Manager for the new workshops, purifier sheds, coal stores, &c., at an estimated total cost of £3522, were approved. It was also reported that the gas-rental for the eleven months ending with March, 1878, amounted to £41,703, as against £43,813 in the corresponding period of 1876-77, or an increase of £890.

On Friday week there were exposed for sale by public auction two Dundee gas annuities for £4 12s. each, and two Dundee water annuities for £12 and £10 respectively. The former were disposed of at 24½ years purchase, and the latter at 24½ and 25 years purchase, respectively.

The Town Council of Selkirk have resolved to request the Directors of the Gas Company to lower the price of gas from 5s. 10d. to 4s. 7d. per 1000 cubic feet.

At the meeting of the Kilsyth Gas Company, on April 5, it was reported that the profits on last year's transactions would enable the Directors to recommend a dividend of 10 per cent., and lay aside the sum of £100 to the reserve-fund. In consequence of the extension of the burgh and building operations lately, new piping has recently been ordered. A new gasholder and other appliances are to be added to the works.

At a meeting of the Police Commissioners of Falkirk on the 8th inst.—Provost Russel presiding—a communication was read from the Directors of the two Gas Companies stating that they would be willing to negotiate with the Commissioners to hand over to them their works, and thus place the arrangements for a supply of gas in the hands of the Authorities. A Committee of the Commissioners was subsequently appointed to consider the letter, make inquiry as to the powers conferred by the Act of Parliament, and report to a subsequent meeting.

The consumption of gas at Rothesay during the month of March was 112,000 cubic feet in excess of the consumption in the same month of last year, and the cost of production was a penny per 1000 feet less.

It is estimated that the new water-works for Port Glasgow will cost £15,330.

The tender accepted by the Ayr Town Council for the construction of the new reservoir at Carline, the new filter, and the laying of the pipes, amounts to a little less than £5000, which is considerably under the Engineer's estimate. The reservoir is to be five acres in extent, with a depth of 25 feet, and a capacity of 20 million gallons. It has been unanimously agreed to proceed with the works at once.

At a meeting of the Edinburgh and District Water Trustees, last Thursday, it was reported that work to the value of £200,000 had been done in connection with the Moorfoot Water-Works, and authority had been given to pay to Messrs. Leslie, the Engineers, the sum of £1000 on account of commission for the same. Some conversation took place as to the time when water might be expected from Glasshouse Reservoir, now reported as nearly completed. Mr. Leslie reported that he did not expect to have the reservoir filled until next winter—unless, indeed, there should happen to be a wet summer. From Mr. Coyne's monthly report upon the town works, it was shown that the quantity of water sent into the city and district in March was equal to 6077½ gallons per minute, representing 8,751,312 gallons per day, or 30½ gallons per head per day to the estimated population of 286,800. The supply to Edinburgh was 31 gallons per head per day to a population of 229,872; to Leith, 29 gallons per head per day to a population of 50,870; and to Portobello, 26 gallons per head per day to a population of 6058.

The new water-works for Largs are estimated to cost £10,800, exclusive of the land taken and expense of arbitration. The original estimate of the cost of the Middleton Reservoir was £9902.

At a special meeting of the Hawick Town Council, last Tuesday, Provost Ewen reported that the Public Works Loan Commissioners had agreed to an application that had been made for a loan of £20,000, at a redeeming rate of 4 per cent. for 20 years, for the purpose of carrying out a drainage scheme for the town.

Plans have been agreed upon by the Police Commissioners of Paisley for a drainage scheme for an important district of the town, which is estimated to cost £10,000.

The Glasgow pig iron warrant market closed on Friday afternoon with prices 1½d. per ton under those of the previous Friday. Business in pig iron was decidedly dull during most of the past week.

Dulness continues to be the rule in the coal market, and business seems to be settling down to the summer demand.

TENDERS FOR GAS-WORKS AT DARENTH, KENT.—The following tenders were received for the erection of gas-works for the Managers of the Metropolitan Asylum District, Messrs. A. and C. Harston, Architects, 15, Leadenhall Street; R. Jones, Esq., Consulting Engineer:—

Miller and Sons . . . . .	£8750
Wilson and Douglas . . . . .	8246
Porter and Co. . . . .	7845
Luke Hook Green . . . . .	7635
Strode and Co. . . . .	7600
Cutler and Sons . . . . .	6542
Bower (accepted) . . . . .	6287

WAVERLEY ASSOCIATION OF GAS MANAGERS.—The thirty-first half-yearly meeting of this Association was held at Kelso on the 11th inst.—Mr. Robb, occupied the chair. Mr. Robson, Treasurer and Secretary, read the financial report, and thereafter Mr. Clazy, as a member of the deputation sent by this Association to the West of Scotland Association Meeting which took place at Helensburgh, gave an admirable report of the kind and fraternal greeting they met with from the brethren in the West. Thanks were voted to Messrs. Clazy and Robson for their attention in this matter. Mr. Robson having expressed a wish to be relieved of the duties of Treasurer and Secretary, Mr. Taylor, of Jedburgh, was unanimously elected to the joint offices in his stead. Mr. Robb was elected Chairman for the ensuing year, and the next meeting was appointed to take place at Haddington, on Thursday, the 5th of September ensuing.

SEVENOAKS WATER-WORKS COMPANY.—The annual meeting was held on the 30th ult.—Mr. W. J. Thompson in the chair. The Directors in their report stated that during the past year there had been a steady advance in the business of the Company. About 1000 yards of additional main had been laid, and 46 new premises supplied with water, producing a rental of nearly £115 a year. The accounts showed an actual increase of £87 12s. 4d. on the water rental, but on account of outlay on repairs, &c., the net profit on the year's working amounted to only £694 14s. 5½d., which added to last year's balance made £909 1s. 6½d. available for dividend. The Directors therefore proposed a dividend of 9 per cent. on the 448 shares issued prior to the last report, and on the 83 shares allotted prior to Dec. 31, 1877. The Company's Bill had passed the third reading. The new works, includ-



ing duplicate set of engines, &c., are in a forward state, and will be ready for use in a few weeks. The Chairman, in moving the adoption of the report, said he believed they would soon be in a position to declare a dividend of 10 per cent. on the capital. In the Bill before Parliament, one of the clauses was to give them an improved capital of £16,000 as against £12,000, the object being to afford the Shareholders a return for the time when they received no dividend at all, and 10 per cent. paid upon the improved capital would be equal to 13 per cent. upon the ordinary capital; he thought that was a state of affairs they ought to be well satisfied with. The report was adopted.

**HULL GAS SUPPLY.**—Mr. J. Baynes has made the following report on the gas supply in the east district:—"Below are the results of my examination of the gas sent into this district by the Sutton, Southcoates, and Drypool Gas Company, during March:—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16.82	16.21	16.54
Grains of sulphur per 100 cubic feet	—	—	15.04
Grains of ammonia per 100 cubic feet	—	—	8.70

Mean barometer and temperature in experiment-room:—Bar., 29.85; Temp., 54.1°.

**QUALITY OF THE NEWCASTLE-ON-TYNE GAS.**—Mr. John Pattinson reports the following as the results of his examinations, for the past month, of the quality of the gas supplied to this borough by the Newcastle-on-Tyne and Gateshead Gas Company:—

Date, 1878.	Illuminating Power in Sperm Candles.	Grains of Sulphur in 100 Cubic Feet of Gas.	Sulphuretted Hydrogen.
March 1	15.5	6.95	Nil.
" 5	15.5	6.34	"
" 8	14.9	5.94	"
" 12	15.4	6.29	"
" 15	15.3	6.91	"
" 19	15.7	6.69	"
" 22	15.4	6.59	"
" 26	15.1	4.99	"
" 29	14.3	6.26	"

A Sugg-Letheby standard Argand burner is used in testing. According to Act of Parliament, the gas should not be of less than 14 standard candles illuminating power, nor contain more than 17 grains of sulphur per 100 cubic feet of gas.

**SPONTANEOUS COMBUSTION OF COAL.**—At the last meeting of the Manchester Geological Society, Mr. J. Dickinson, Her Majesty's Senior Inspector of Mines, who occupied the chair, spoke at some length on coal combustion, with special reference to the inquiry lately held at Liverpool into the causes of the ignition of coal on shipboard. This question, he remarked, was of much moment to Lancashire, because it had been said that Lancashire coal was especially liable to spontaneous combustion. He, however, pointed out that a great deal of the combustion of coal on board vessels arose from the careless loading more than from the nature of the coal. From what he had seen of the coal in the Lancashire district, he did not believe that there were whole seams which were affected in such a way as to cause them to be specially liable to spontaneous combustion. What was shown by the evidence was that some of the coal that had taken fire on board a vessel had been sent from the Lancashire district; but he had been able to show that, so far as the above district generally was concerned, there was a clean bill of health in this respect. The Assistant-Inspector for West Lancashire had stated that two of the mines in that district were on fire; but he went a little too far in saying that these seams were, consequently, not suitable for export. It was quite possible in a seam of coal that portions of it might be entirely free from liability to spontaneous combustion; but there might be bands of earthy matter, separating the bands of coal, which were liable to it. It was his experience that spontaneous combustion was not so much due to the coal itself as to the intervening bands, and it seemed a very serious matter to denounce one or two seams of coal simply because there might be intervening bands in them which were liable to spontaneous combustion. Whilst he was sitting at the examination, he was much struck with the manner in which ships were loaded at Liverpool. He had pointed out that if people who were accustomed to stock coal in Lancashire were to stock it by dropping it from a great height, as was the case when it was thrown into the hold of a ship, they would not be surprised if spontaneous combustion took place. In loading ships, he recommended that they should commence to build up from the bottom, or else place planks down into the hold. This was a matter which he should like to see gone into by the Society, and he thought there were members who could give them a paper upon it which would be very useful.

**SECURITY FOR GAS-RATES AT CHORLEY.**—At the meeting of the Chorley Improvement Commissioners on the 28th ult., it was stated by Mr. Richmond, a member of the Commission, that they were losing a great deal of money through people being supplied with gas and then leaving the town. The Gas Committee, therefore, recommended more stringent regulations, and he moved:—(1) That any person who has previously kept a satisfactory account with the Commissioners and who applies for a new supply of gas, will be accommodated on the usual credit terms. (2) An applicant who has not been a previous consumer, and whose premises are held on a weekly tenancy, will be asked to leave a deposit sufficient to cover one quarter's consumption; after he has been supplied for two years, and the account has been punctually paid, the deposit may be withdrawn, and he will be supplied on the usual credit terms. (3) If the consumer is unwilling to leave a deposit, he may in lieu thereof furnish the Commissioners with a guarantee, signed by any person who has had a satisfactory account with the Commissioners for not less than two years. It will not be necessary that the guarantor should attend personally to sign the guarantee, but a note will be sent to him to inform him that his security has been accepted." Mr. Forrester moved an amendment that it be referred to a special Committee. He thought the Committee had hardly given the question that care and attention which it deserved, inasmuch as he understood that the proposed regulations would affect about 300 persons, who would at once have their supply of gas cut off. He thought some other mode might be found for dealing with defaulters and those who were behindhand in their payments for gas. The Clerk said this was a very important matter indeed, as there was still about £500 outstanding. The Collector, however, had written a very elaborate report on the subject, and he (the Clerk) thought it was absolutely necessary that something should be done to get the money. Persons using the gas without paying for it were really cheating the ratepayers. Mr. Richmond said the Committee had had to forego a large amount of accounts, and he thought if the regulations were carried out they would not lose a penny. Similar regulations were enforced at Birmingham, Blackburn, and other places. Mr. Widdows feared that if the regulations were adopted they would check consumption of gas, for people would use lamps, which would be cheaper. Mr. Eccles (the collector) said he thought there was great room for improvement in the collection. He had frequently to summon persons to the County Court, and even after getting an order they ran away and took their furniture. The motion was then carried.

**DIRECT-ACTING PUMPS.**—At the meeting of the Institution of Civil Engineers, on Tuesday, the 26th ult.—Mr. Bateman, President, in the chair, the paper read was "On Direct-Acting or Non-Rotative Pumping-Engines and Pumps," by Mr. Henry Davey, Assoc. Inst. C.E. The author discussed some new forms of direct-acting pumping-engines and pumps, as a question of relative cost and efficiency, illustrating his arguments by practical examples. The direct-acting engine had a wider sphere of application in mining operations than elsewhere, and experience had proved it to be the best type for deep mine and heavy pumping. Until lately, the Cornish had been the only direct-acting expansive engine. It was a very economical machine, under favourable circumstances, but its range of expansive working was limited. Compound rotative engines had been made to do a higher duty than Cornish engines. In the early days of pumping, Hornblower, Trevethick, Woolf, and Sims experimented with compound Cornish engines in Cornwall, but these attempts had failed because the engines were single acting, and the distribution of steam was such as to lead to great thermal loss from the cooling influence of the condenser. From these and other practical defects the engines fell into disuse. To work direct-acting engines expansively certain conditions were necessary. An inert mass must be provided, which, by its inertia at the beginning and momentum towards the end of the stroke, should compensate for the diminishing pressure of the expanding steam employed in overcoming the almost uniform resistance of the pump. In single-cylinder engines this involved heavy initial strains, considerable piston speeds, and a large inert mass to render a high degree of expansion possible. These obstacles were removed in the direct double-acting compound engine. This part of the subject was graphically illustrated by indicator and velocity diagrams, taken from compound and Cornish engines under various conditions of working, the results being tabulated. The relative cost of compound and of Cornish engines was next compared, and it was shown that the cost of the engine and buildings was less for the compound than for the Cornish engine. The author then described certain improvements in valve gears, and discussed the construction of pumps and pump-valves, advocating much heavier lifts than those commonly used. As examples, a 200-horse power compound engine, employed underground in forcing against a column 1100 feet in height, and a 600-horse power compound engine, actuating two 20-inch plungers by spears, against a column of 700 feet, were referred to. An improved form of pump work was adopted to render such heavy lifts practicable and safe. Twenty varieties of pump-valves were illustrated, and diagrams of the lift of pump-valves, and others showing the shocks produced in the opening and closing of valves, were exhibited. In an addendum the author touched briefly on three questions of special interest in connection with the subject of the paper. These related to the economical use of steam in regard to the degree of expansion, as to how greater economy might be secured, and as to the condition of maximum efficiency.

## Register of New Patents.

4115.—SIMCOX, E., Birmingham, "Improvements in the manufacture of taps and cocks." Provisional protection only obtained. Dated Oct. 24, 1876.

In carrying out this invention the usual chill moulds are employed to produce the plug of the tap, which plug is afterwards used as a core, round which the barrel is cast. In the mould in which the barrel is to be cast is laid round the plug one or more junction-pipes, which are thus cast into the tap simultaneously with the formation of the barrel. As soon as the casting is set, the plug is knocked out, and the cast barrel then sinks slightly, which sinking compensates for the necessary grinding of the plug, and thus allows it to be truly fitted. There is cast upon the small end of the plug the screw-pin ready screwed to receive a six-square nut, and thus the usual drilling or tapping is avoided, and the cock or tap produced without boring or turning, or the use of the lathe at all.

4221.—LAKE, W. R., Southampton Buildings, London, "An improved pressure indicator for taking continuous diagrams." A communication. Patent dated Nov. 1, 1876.

This invention relates to an apparatus for indicating pressure, and comprises a small cylinder open at its upper end, and provided with a tubulure and cock for communicating at the bottom with the apparatus containing the steam or gas to be experimented with. A solid piston within this cylinder is controlled or actuated by a spring, and according as the pressure of the gas or steam is greater or less than that of the atmosphere, the piston rises or falls, compressing or extending the spring.

4233.—GENT, J. S., Salford, "Improvements in apparatus employed in the manufacture of gas-burners." Patent dated Nov. 6, 1876.

This invention relates to the apparatus employed in the drilling, facing, and forming of gas-burners. In such apparatus previously constructed the partly-formed burners, or blanks, have been held in tongs by the attendant, or have been singly placed in holders, and moved towards the drill or cutting or shaping tool by the attendant. According to this invention the blanks are fed into an apparatus in which each is seized by a vice or by holding jaws, is adjusted in position in such jaws, and is moved towards the drill or cutting tool, and, after being withdrawn therefrom, is released, the rate of feed towards the tool being determined by the apparatus, and not by the pressure of the hand of the attendant.

4296.—WESTINGHOUSE, G., Liverpool, "Improvements in, and in apparatus for, lighting railway carriages." Partly a communication. Application dated Nov. 7, 1876. [Void by reason of the patentee having neglected to file a specification in pursuance of the conditions of the letters patent.] This invention relates to lighting railway carriages by the combustion, at suitable burners, of the vapour of a hydrocarbon carried in mechanical suspension in a current of air, or hydrocarbon vapour in admixture with air, and has for its main objects to provide a light at comparatively low cost, of high illuminating power, and that without incurring the danger attendant upon carrying hydrocarbon liquids in bulk upon vehicles. By air is meant atmospheric air, hydrogen, or other gas suited for lighting when charged with the vapour of a hydrocarbon.

4379.—OTHON, L. P., Victoria Chambers, Westminster, "Improvements in pumps." Patent dated Nov. 11, 1876.

This pump consists of a flexible india-rubber tube inserted along the inside of a segment of a circular frame made of wood or metal. The frame carries an axis, on which are fixed cross-bars, having at their ends rollers, and the working of the pump is produced by turning a handle, which rotates the axis and cross-bars. The rollers at their extremities come in succession against the tube so as to flatten it against the segment of the frame. The segment of the circular frame upon which the tube is, is a little longer than the distance between the rollers, so that the action of the next roller may be brought to bear upon the tube before the other has left or ceased acting. By means of the expulsion of the air from the tube, suction is produced, and the forcing effect is produced by the following rollers acting upon the tube.



4380.—O'NEILL, A., Baltimore, U.S.A., "Improvements in pipe-joints." Patent dated Nov. 11, 1876.

This invention has for its object the formation of joints in soil, drain, heater, and other pipes, without the use of hot lead or costly cement, and without lapping the sections. It is specially designed for use in connection with cast-iron pipes, but is not limited in its application thereto.

In carrying out the invention the pipe is constructed in sections, with lugs or flanges on each end, and with a collar encircling the joint, and provided with flanges or lugs, adapted to fit the lugs or flanges on the pipe ends, the ends being drawn together by a rotary movement of the collar. Each section of pipe is constructed with a recessed end for the reception of a gasket, and a spigot end to fit securely on such gasket, and with external lugs or flanges, by means of which the end of one section is held to the gasket on the other by the action of a screw-collar encircling the joint. The pipe sections are further provided with fixed collars, beads, or flanges, to receive pressure from a suitable jack, by which the ends are forcibly pressed together, while the screw-collar is adjusted to hold them.

To adapt these improved couplings for use in connection with a common pipe, or with a short section from which the peculiar recessed or spigot end, as the case may be, has been cut away, detached hubs or coupling ends are provided, adapted to receive and securely pack the cylindrical end of such cut or common pipe, and constructed with either a spigot or recessed end, so as to adapt them to fit either the recessed or spigot end of the next section, as may be required.

#### APPLICATIONS FOR LETTERS PATENT.

- 1243.—CUTLER, S., Millwall, London, "Improvements in valves." March 29, 1878.  
 1252.—ADAMS, A., Narborough, and COLTMAN, T., Leicester, "Improvements in indicating regulator cocks and valves." March 30, 1878.  
 1260.—KER, A. P., Birmingham, "Improvements in apparatus used in the purification of gas." March 30, 1878.  
 1267.—CLIFF, W. D., Wortley, Yorks, "Improvements in the manufacture of furnaces for gas and other works." March 30, 1878.  
 1299.—CLARK, A. M., Chancery Lane, London, "An improved gas lighter." A communication. (Complete specification.) April 2, 1878.  
 1306.—HULETT, D., High Holborn, KIRKHAM, T. N., Westminster, and CHANDLER, S. and J., Newington Causeway, London, "Improvements in apparatus used in the manufacture of gas." (Complete specification.) April 3, 1878.  
 1313.—HENDERSON, A. C., Southampton Buildings, London, "Improvements in wrenches or spanners." A communication. April 3, 1878.  
 1324.—ROLSTON, W. W., Birmingham, "The diffusion of liquids in the form of spray, the title of which is 'Rolston's Spray Diffuser.'" April 4, 1878.  
 1333.—PEYTON, J. W., Exmouth, and SALMON, J., Exeter, Devon, "A new or improved 'self-measuring' tap or 'meter' tap." April 4, 1878.  
 1355.—BILLING, C. E., Hatton Garden, London, "Improvements in gas-burners and reflectors for heating and warming purposes." April 5, 1878.  
 1361.—WHEELER, E. G., Strand, London, "Improvements in and appertaining to machinery or apparatus for compressing ammoniacal and other gases, parts of which improvements are also applicable to machinery for compressing air, and to other purposes." April 5, 1878.  
 1363.—TURNER, F. W., St. Albans, Hertford, "Improvements in motor-engines to be worked by water, steam, gas, or other fluids, which improvements are partly applicable to fluid-meters." April 5, 1878.  
 1386.—ATTCHISON, A., and TAYLOR, R. N., Manchester, "Improvements in

apparatus and materials for producing gas for illuminating and heating purposes." April 8, 1878.

1391.—LAKE, W. R., Southampton Buildings, London, "Improvements in apparatus for measuring water or other liquids." A communication. (Complete specification.) April 8, 1878.

1437.—LAKE, W. R., Southampton Buildings, London, "An improved repeating match or igniter for lighting gas, gunpowder, fuses, tinder, and other substances capable of ignition by a flash." A communication. April 10, 1878.

1445.—MORGAN-BROWN, W., Southampton Buildings, London, "Improvements in regulator valves or cocks." A communication. April 11, 1878.

#### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

3706.—ANNELL, O., Stockholm, Sweden, "Improvements in gas governors or regulators." Oct. 5, 1877.

3724.—ALEXANDER, E. P., Southampton Buildings, London, "Improvements in water-filters." A communication. Oct. 8, 1877.

3815.—GAMBIER, H. C., Paris, "Improvements in gas-stoves." Oct. 15, 1877.

3817.—HAMMOND, J., Lewes, Sussex, "Improvements in purifying coal gas." Oct. 15, 1877.

3840.—HASTIE, J., Greenock, N.B., "Improvements in hydraulic motive-power and pumping apparatus." Oct. 17, 1877.

3870.—PEARNE, F. and S., Manchester, "Improvements in steam-pumps, and in valves used for pumping water, air, and other fluids." Oct. 19, 1877.

4432.—RAPIEFF, J., Middle Street, London, "Improvements in the production and application of electric currents for lighting and other purposes, and in apparatus employed therefor." Nov. 24, 1877.

4825.—LONGSHAW, J., Warrington, Lancs, "An improved gas-tap." Dec. 19, 1877.

12.—ROBINSON, H., and MELLIS, J. C., Victoria Street, London, "Improvements in the treatment of sewage and impure waters." Jan. 1, 1878.

172.—ALEXANDER, J., Lanark, N.B., "Improvements in engines for compressing air or gas." Jan. 14, 1878.

173.—HUNT, B., Lincoln's Inn, London, "Improvements in the process of and apparatus for superheating steam, and making, heating, and illuminating gas." A communication. Jan. 14, 1878.

233.—THOMAS, H., Oldham, Lancs, "Improvements in gas-meters." Jan. 18, 1878.

407.—HOBBS, G. W., Market Harborough, Leicester, "Improvements in pumps." Jan. 31, 1878.

555.—BROWN, J., Old Kent Road, London, "Improvements in cocks or valves." Feb. 9, 1878.

#### PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1053.—RAWLINGS, H., "Certain improvements in the construction of filters for the purification of water and other liquids." March 23, 1875.

1209.—BREEDEN, J., "Improvements in sliding chandeliers and gaseliers." April 3, 1875.

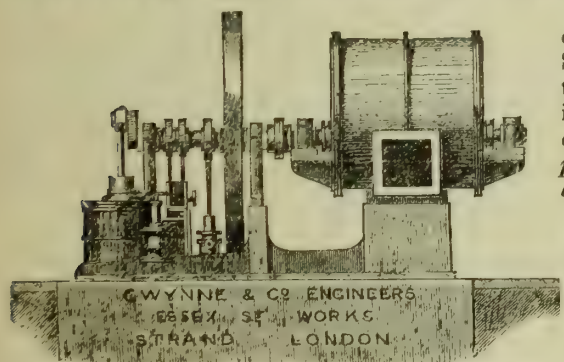
#### PATENT WHICH HAS BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

804.—DOVER, R., "A mode and means for preventing the flow or passage of sewage into rivers or streams from the sewers, drains, and other channels, and retaining the sewage matters for agricultural purposes." March 24, 1871.

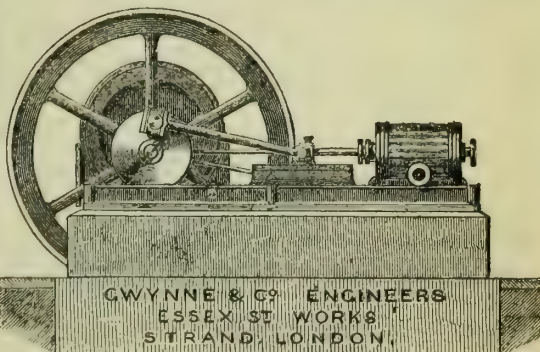
The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

## GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

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### D. BRUCE PEEBLES & CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

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**WANTED, a Representative in every** large town, for the Sale of Tubes, Fittings, and all kinds of Gas Apparatus.

Address MANUFACTURER, care of Messrs. Dawson and Sons, Cannon Street, LONDON, E.C.

**SECRETARYSHIP.**—The Advertiser acts as Secretary to one small Gas Company, and is competent to take another, having plenty of spare time, and good offices in the centre of London. The highest references can be given.

Address No. 453, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED.**—A gentleman of influence, already calling on Gas Companies, wanted to represent a London firm on Commission. To a first-rate man this will realize a large income.

State full particulars to C. B. S., care of Messrs. G. Street and Co., 30, CORNHILL, E.C.

**WANTED, a Working Manager for a** small Gas-Works making about 10 million feet per annum.

Application, in writing only, and copies of testimonials to be sent to Messrs. KIRKHAM AND HERSEY, 21, Abingdon Street, WESTMINSTER, S.W.

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**WANTED, by the Colchester Gas Com-**pany, a competent MAN, capable of laying Mains and Services, taking and testing Meters, &c. Must be well recommended. Age between 25 and 30 years. Wages 35s. per week, with house, coals, and gas.

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**WANTED, for the Slough Gas-Works** (Bucks), a WORKING MANAGER, who must be conversant with the Manufacture and Distribution of Gas, and with Main and Service Laying.

Preference will be given to candidates who can set Retorts and do the Smithing.

Wages 30s. per week; cottage, coal, and gas found.

Candidates must be able to enter upon the duties immediately—vacancy caused by decease of late manager.

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**WANTED, a situation—Main and** SERVICE LAYER, Gas-Fitter (iron and compo.) willing to make himself useful indoor or out—by a married man, aged 24 years. Testimonials and references.

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**A Gentleman of many years experience** in the Chemical and Photometrical Examination of Coal Gas, desires an APPOINTMENT. Could fill up his time with Office or other suitable work.

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**WANTED, by Samuel Thompson & Co.,** Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

**WANTED, Readers of the Pamphlet,** "Cooking and Heating by Gas; on Burners," &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Gas-Works, SYDENHAM, S.E.

**WANTED, to proceed at once to a port** in Brazil, a young gentleman who is a competent ACCOUNTANT and BOOK-KEEPER. A knowledge of the Portuguese language and Gas Accounts would be desirable.

Address G. C., care of Housekeeper, 7, Union Court, OLD BROAD STREET, E.C.

#### TO GAS ENGINEERS AND MANAGERS.

**WANTED, by a Retort Setter, an** APPOINTMENT, permanent or otherwise; or would take work by the piece. Well acquainted with Plans. Good references.

Address J. C. I., 10, Albert Street, Ryde, ISLE OF WIGHT

**WANTED, a gentleman, having a good** connection with Gas Companies throughout England to travel, for a Coal Factor.

Address, with full particulars, No. 448, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, several Thousand Tons of** good GAS COKE, in Midland or Northern Counties, in Lots of 50 to 1000 Tons.

Address G. J. EVESON, Gas Coal and Cannel Contractor, BIRMINGHAM.

#### SPENT OXIDE OF IRON.

**WE are open to Buy this in any quan-** tity.

Address, with price, to NICHOLSON AND SONS, Chemical Works, Hunslet, near LEEDS.

**FOR SALE—A First-Class Station-**METER, to pass 20,000 cubic feet per hour. May be seen at work. It is to be disposed of to make room for one of greater capacity.

Apply to E. GODDARD, Gas-Works, IPSWICH.

**TO BE SOLD—A complete Apparatus for** ascertaining the quantity of Sulphur and Ammonia in Gas, as ordered by the Gas Referees.

For particulars, apply to JONATHAN WILKINSON, Gas Engineer, &c., Grimsthorpe, LUTHERFIELD.

**GASHOLDER, now at work, and in** good condition, FOR SALE; 45 ft. diameter, 18 ft. deep; Six Columns and Girders, with Chains and Balance-weight.

Apply to the Horseley Company, Limited, Tipton, STAFFORDSHIRE.

**ON SALE—One Station-Meter, to pass** 1000 cubic feet per hour. Almost new. Will be sold cheap.

Apply to J. HALL, Gas-Works, St. Helen's, LANCs.

#### SULPHATE OF AMMONIA PLANT.

**THE above Plant, erected on the newest** and most improved method, at less than half the cost of other plans, gives better results, requires less labour, and allows no gases or offensive smell to escape. Reference kindly permitted to manufacturers as to efficiency and cheapness of plant &c.

For particulars, address JOHN G. HARVEY, Chemical Works, Little Island Cork.

#### BEVERLEY CORPORATION GAS-WORKS.

**THE Corporation of Beverley are pre-**pared to receive TENDERS for the Purchase of the AMMONIACAL LIQUOR and the surplus TAR made at their Works for the period of One, Two, or Three years, from the 1st day of May ensuing.

Tenders, endorsed "Tender for Tar, &c.," to be sent to me on or before the 25th inst.

For further particulars, apply to Mr. E. Bryan, Manager, Gas-Works, Beverley.

By order,

THOMAS CRUST, Town Clerk.

Guildhall, Beverley, April 3, 1878.

#### GUILDFORD GASLIGHT AND COKE COMPANY.

**THE Directors of the above Company are** prepared to receive TENDERS for the Supply of 5000 tons of GAS COAL and 3000 tons of CANNEL. The deliveries to extend to Two years, from April 30 inst.

Tenders, quoting price per ton, delivered free either at the Gas-Works or Railway Station, Guildford, to be endorsed "Tender for Coal or Cannel," and must be delivered on or before April 22nd inst., to Mr. LONGWORTH, Gas Offices, Guildford, from whom any further required information may be obtained.

Gas Offices, Guildford, Surrey, April 5, 1878.

#### GAS TAR.

**THE Directors of the Newton Abbot Gas** and Coke Company, Limited, are prepared to receive TENDERS for the Purchase of the surplus TAR made at their Works, for a period of One, Two, or Three years, from the 1st day of May next.

The tenders must state the price which will be given per 1000 gallons. The purchasers to find barrels, deliver and remove the same from the Works, after being filled by the Company. The purchase to be paid for quarterly.

Tenders to be addressed to the Secretary of the Company, and delivered on or before the 30th of April next.

By order of the Directors,

JAMES CHAPPLE, Secretary.

Dated, April 6, 1878.

#### WEST HOUGHTON GAS-WORKS.

**THE West Houghton Gas Company are** prepared to receive TENDERS for One 12-inch Dry-faced CENTRE VALVE for four Purifiers, the Valve to be delivered at West Houghton Station.

Tenders to be sent to the undersigned, on or before Thursday, April 25, 1878.

By order,

JOHN PICKUP, Manager.

West Houghton, April 1, 1878.

#### GLASGOW CORPORATION GAS.

**RESIDUAL PRODUCT WORKS TO BE LET, AND** RESIDUAL PRODUCTS FOR SALE.

**THE Glasgow Corporation Gas Com-**missioners are prepared to receive OFFERS for a Lease of their RESIDUAL PRODUCT WORKS at Dawaholm, near Maryhill, and also for the PURCHASE of the TAR and AMMONIACAL LIQUOR produced at their Gas-Works there.

The Lease to be for such term of years, from June 1, 1878, as may be agreed on.

Offerers must offer a fixed Rent of £1200 per annum, and also a further sum in respect of each ton of Coal carbonized at the Dawaholm Gas-Works.

On application at the Gas Office (Manager's Department), 42, Virginia Street, intending offerers will receive orders for inspecting the Works.

The Conditions of Let and Sale may be seen, and forms of offer obtained, on application to the subscriber; and offers will be received by him up till Monday, the 22nd current.

The Commissioners do not undertake to accept the highest or any offer.

J. D. MARWICK, Clerk to the Commissioners.

City Chambers, Glasgow, April 2, 1878.

**THE Directors of the Whitworth Vale** Gas Company invite TENDERS for the Supply and Erection, at their Works, of one Annular Wrought-Iron CONDENSER, area about 1200 superficial feet, and one SCRUBBER, 40 ft. by 7 ft.

Tenders, accompanied by designs, &c., must be sent to the undersigned, on or before the 23rd inst., from whom any further information may be obtained.

The lowest or any tender not necessarily accepted.

EDMUND LORD, Manager, &c.

Whitworth, near Rochdale, April 13, 1878.

**TO MANUFACTURING CHEMISTS AND OTHERS.**

**THE Directors of the Drighlington and** Gildersome Gaslight Company are prepared to receive TENDERS for the Purchase of the whole of the AMMONIACAL LIQUOR produced at their Works, New Lane Bottom, Drighlington, for a term of One, Two, or Three years, commencing the 1st day of July next.

Further information may be obtained on application to the undersigned, to whom sealed tenders, endorsed "Tender for Liquor," must be sent on or before the 7th day of May next.

WM. STANSFIELD, Secretary and Manager.

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WITH

## Wrought-Iron Spindles and ENGINES COMBINED.

SOLE MAKERS,

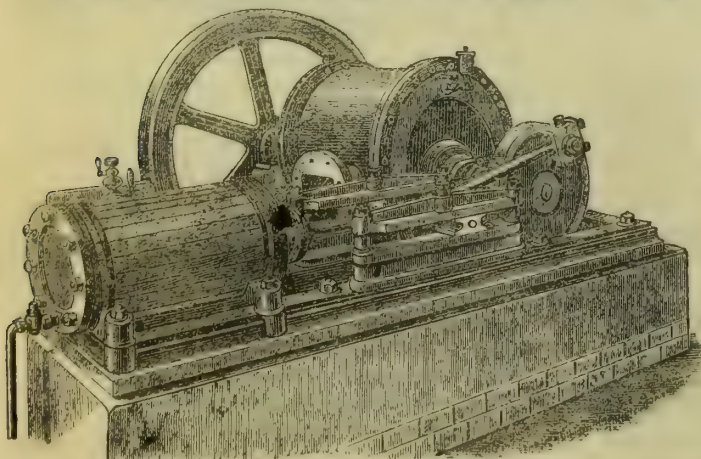
**GEORGE WALLER & CO.**

MAKERS OF ENGINES, EXHAUSTERS,  
INDEX AND DISC GAS-VALVES,  
HYDRAULIC MAIN VALVES,  
BYPASS VALVES,  
TAR, LIQUOR, AND OTHER PUMPS,  
SCRUBBERS AND PURIFIERS,  
CONDENSERS, BOILERS, &c.

Awarded Silver Medal at the Manchester Exhibition of the Society for the Promotion of Scientific Industry.

Phoenix Engineering Works:

**HOLLAND STREET, SOUTHWARK, S.E.**





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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 23, 1878.

Circular to Gas Companies.

In a certain sense the fate of the Metropolitan Gas Companies may be said to be bound up with that of the Water Companies. For the moment, and probably for many years to come, these latter will be free from fresh assaults on the part of the Local Authorities. When, however, a complete municipality is formed, we may safely anticipate renewed attacks. It may be that, before a municipality is constituted, we shall have to face that curious institution, a Royal Commission, which some recommend should precede the coming Corporation, and get things into order before Aldermen and Common Councilmen put their meddling fingers upon them. That the Gas Companies can take care of themselves equally as well as the Water Companies, is now so thoroughly understood, that it is not likely the existing authorities will again venture to raise a hand. Peace will reign until a strong Government takes up in earnest the question of Metropolitan Municipal Legislation. It by no means follows, however, that the constitution of a municipality should be fatal to the existence of the Gas Companies, or, we ought rather to say, the existence of one Gas Company. We have repeated with wearisome iteration that Gas Companies can do just as well for consumers as, or even better than, Corporations. It is perfectly clear, however, that one Company can do very much better than several. The economies which may be effected by combination are so patent that all sensible observers look to union as the remedy for present complaints. As a matter of fact, very few who regard municipal control as a cure for existing evils are actuated by a desire for united management; but this secured, we believe there would be an end to all metropolitan gas agitation. It slumbers, it is true, for the moment, but it is certain to be again aroused when any Companies are brought prominently before the public by parliamentary proceedings. The present quiet time we regard as pre-eminently favourable for negotiations tending to the union of the Gas Companies. The times, so far as they are concerned, are prosperous. Trade everywhere languishes, but Gas Companies still continue to pay ten per cent. We are happy to

believe that, if the union which this JOURNAL has always suggested, should be effected under modern legislation, the one Company might pay more than ten per cent. to their Shareholders. These desultory thoughts in the times which are dull to all but holiday makers, whose pleasures we cannot share, may, perhaps, set some thinking who can influence more than we can the progress of events. There is no reason why Metropolitan Gas Companies should succumb to dictation either from Local Authorities or from a Central Government. Their case is in their own hands. They have the opportunity of showing that they can do better for their customers than any Metropolitan Authorities, and we hope they will lose no opportunity of demonstrating this fact to the satisfaction of the public.

We publish in another column a letter from a Country Manager, who puts a very distinct case. It is to the interest of every Gas Company to supply consumers, when a profit can be secured on the outlay and on the consumption. There can be no doubt that, in the case put to us, the Directors are neglectful of their true interests when they refuse to supply even the few houses which our correspondent describes. There is in this case, we fear, no possibility of compulsion on the part of the proposed consumers; still the sound policy of the Directors is clear and evident. Let all do their utmost to promote consumption when there is a fair prospect of profit. The General Acts are simply intended to guide Directors on general principles; but in the case put by our correspondent the operation of the Act of 1871 need not be considered.

The Exhibition of Gas Apparatus for Economic and Domestic Purposes, projected by the Corporation of Birmingham, ought to be very successful. The rewards and the conditions of exhibition may be considered liberal, while the profits to successful exhibitors, who otherwise would not have such an opportunity of displaying their apparatus, may be estimated at a high value. Some Birmingham manufacturers are eminent, as the makers of cooking and heating stoves, all over the country, but it is quite likely that the knowledge of their apparatus has never been brought home to their nearest neighbours. We look forward to this Exhibition with much interest, feeling certain that it will be productive of good, not merely to the Corporation of Birmingham alone, but to Gas Companies and Gas-works-owning Corporations. We earnestly wish that many more of these exhibitions could be organized. The electric light will not cook, and will not warm; gas will do both. Of one thing we are reminded, and we must impress it upon the Superintendent of the Birmingham Exhibition, and that is, the necessity of the preparation of a paper showing or setting forth the economy of the use of gas for cooking and heating purposes. A compilation from the addresses of the Rev. Dr. Phelps and of Mr. F. W. Hartley, not to mention others who have sought to extend the use of gas, would be very useful and instructive to the visitors to the Exhibition. It must be remembered by intending exhibitors, that competent persons should be present to explain the objects and use of the apparatus, and that, at suitable times of the day, practical experiments should be made. How instructive and useful such an Exhibition as is here proposed may be, is well seen in the case of the one at Stockton, which is described in another column. There an enterprising Gas Manager has gathered together sets of apparatus, and an excellent display of bye-products, which delight the eyes while they instruct the minds of crowds of visitors. The marvels of gas and its uses are perfectly revealed. That beautiful instrument, the meter, we are happy to say, was shown in, what we may call, its naked simplicity, for it was exhibited in action in a glass case. The Exhibition at Stockton has proved most successful, and at Birmingham, we have no doubt, will prove of still more value.

A report from the Accountant of the Preston Corporation informs us that the Preston Gas Company have paid full dividends, which, however, necessitated the withdrawal of a small sum from the reserve-fund, but leaving it still at a very respectable amount. In these days draws on reserve-funds ought to be avoided, and prices should be adequate to produce normal profits.

When writing last week about the dividend of the South Metropolitan Gas Company, we remarked that we believed they were the only statutory Gas Company who were paying eleven per cent. A friend corrects us, and tells us truly that the Leicester Gas Company have for the past half year paid eleven and a half per cent. The standard price granted to the Company by their Act of last year was 3s. 4d. per thousand feet; but they have been selling gas to the consumers at 2s. 10d., and since the undertaking on June 30 next passes over to the Corporation, the Directors will very properly divide the greater part of their profits. A sum of about £2500 is, however, carried forward to



the next account. Let us hope against hope that the Leicester Corporation will be able to do as much for the gas consumers.

The first of the Birmingham out-townships have gone in for a loan to enable them to set up gas-works. We do not yet know what sums have been awarded to the Corporation of Birmingham for their interest in the limits of surrounding districts. Smethwick, however, went to the Local Government Board to obtain power to borrow £43,000, but they were kindly advised by a liberal-minded Inspector to ask for £50,000, and, at the same time, he intimated that another £10,000 might be obtained by an application for a Provisional Order. Other Boards in the district of the *quondam* Birmingham and Staffordshire Gas Company will presently be making applications for loans, and will obtain them; but, bitterly as we regret every transfer of a gas undertaking to a Corporation, we feel bound to express an opinion that all these Local Boards will have reason to regret their disassociation from Birmingham.

The Mitcham Gas Company, we believe, deal liberally with their consumers. They have a wide and straggling district, in which the consumption per mile is comparatively small, but, nevertheless, their charge per thousand feet is considerably below the maximum allowed by their special Act. The Local Board of Wimbledon, however, are not satisfied with the charge for public lamps, and have announced their intention to advertise for tenders for the supply of oil lamps to their district. The idea is extremely absurd, for in no single instance have oil lamps given satisfaction, nor has any great saving been effected where they have been brought into use. At the same time, the Board ask for a tender from the Gas Company. No doubt the object of the Board is to frighten the Gas Company to a low contract; but the device is certain to fail in its object. Public lights are not highly remunerative to Gas Companies at the best of times and places, and particularly in sparsely populated limits like those of the Mitcham Company.

However great may be the success, physically, of the electric light in Paris, financially, it would appear by a paper translated in another column, it is, to say the least, in a muddle. When inventors and promoters begin to squabble, it bodes ill for shareholders. We express no opinion on this case, since the matter simply concerns French investors; but we shall probably soon have an Electric Lighting Company projected in London, and the record of what has taken place in Paris may be useful.

Mr. W. H. Michael, whose name is so familiar to our readers as the talented co-editor, with Mr. Shiress Will, of "The Law of Gas and Water Supply," and from his extensive practice in Parliamentary Committees in connection with Gas and Water Bills, has been appointed Q.C., and was on Wednesday last called within the bar of the Lords Justices of Appeal. This honour comes rather late to so distinguished a man. Like Sir James Mackintosh, Mr. Michael was educated for the medical profession, but subsequently chose the Bar as his career. The combination of scientific and legal knowledge is eminently serviceable in some departments of the law, as was well illustrated in the case of Mr. Justice Grove. It would be well if scientific knowledge was more common to members of the Bar, for then witnesses would be more discreet and judges more enlightened.

### Water and Sanitary Notes.

On the evening of the 15th inst., Mr. Slater-Booth, in reply to Mr. Fawcett, said that the Government had ample materials at their disposal to form an opinion, when the time arrives for legislation upon the Metropolitan Water Question. When will the time arrive? It is perfectly certain that, in the present confused condition of metropolitan municipal affairs, the purchase of the Water Companies is, to say the least, inexpedient. Bitter as the pill will be to swallow, the Metropolitan Board of Works can do nothing but withdraw the Bills they have promoted this session. It may, we think, be accepted as a fact, that the Government of the day do not recognize in the Board a body to be entrusted with the administration of the water supply. Clearly, then, the time for legislation has not yet arrived. Two eventualities are possible. A Government—we do not say that of to-day—may see their way to the constitution of a sort of Royal Commission, to whom the undertakings would be handed over, to be dealt with as able engineers and financiers might direct; but there is that other contingency, which looks to us more probable, that before many years have elapsed the Metropolis may have a complete municipal organization, to whose care the undertakings can be confided. At the present moment, it is true, the Government do not seem disposed to take up the question; but it is being forced upon them more and more strongly every day. The ordinary ratepayer, it is true, seems to take but little interest in the matter, and the agitation is mainly

confined to *doctrinaires*. It is noteworthy that at the present conjuncture, Serjeant Pulling, a veteran Municipal Reformer, of whom we have heard but too little for some years past, comes forward with a proposal for a "Systematic Government for London." We may remark also that Sir Sydney Waterlow, in the recent debate on Sir U. Kay-Shuttleworth's motion, speaking in the name of, but not with the authority of, the Corporation of London, announced that that body would not oppose any well-digested plan of municipal organization. Perhaps, then, we are justified in concluding that the day is not distant when the Metropolis will have the benefit of a complete system of Local Self-Government. When that time arrives, many will consider that the water and gas questions are ripe for legislation; but will that be the case? What has the Metropolitan ratepayer to gain by the transference of the water undertakings to a municipality?

It seems clear to us, and we are supported in our opinion by the "Civil Engineer" whose able pamphlet we noticed a week or two ago, that, putting aside the chimerical dual scheme of the Metropolitan Board, a large increase of taxation must of a necessity result from the purchase of the water undertakings by the present Metropolitan Board, and, therefore, by their transference to any other municipal body. The question remains whether the Water Companies themselves cannot come to an arrangement which will effect, at a far more economic rate, all the benefits which it is supposed would be derived from combination under a Commission or a Corporation. If such combination should take place, some levelling-up of rates would be inevitable; but that must, in any case, ensue if the works were bought. We have no doubt that great advantages might be secured by the union of the capitals of the several Companies. Works now deficient might be placed in effective order, and we should hear no more of turbid water containing living and moving organisms. The time, if not ripe for legislation, is for amalgamation, and we once more throw out the hint that the continued assaults made on the Companies will be best met by the solid front which can only be presented by a complete amalgamation.

We have now before us an abstract of the award of the Arbitrators in the case of the purchase of the Stockton and Middlesbrough Water Company. It will be remembered the consideration settled before Committee was twenty-five years purchase of maximum dividends; but then there remained the compensation for prospective profits and compulsory purchase. This was what the Arbitrators had to assess, and the award shows that they have given the Company the sum of £213,802. This, added to £466,175, the capitalized value of the dividends, together with expenses, makes the cost of the undertaking to the joint Boards about £750,000. A local print remarks that the Boards have acquired a "white elephant," and, as may be expected, great dissatisfaction is now expressed. The Boards have not yet arrived at the end of their troubles. New works will soon have to be commenced, which will involve still further expense, and it is difficult to see at the present moment where the cost of the water-works will end. In the state of trade to-day, this award comes as a heavy blow to the depressed ratepayers of Stockton and Middlesbrough. It is, however, we believe, a just one, and may serve as a warning to all who desire to confiscate their neighbours property.

We are happy to see that northern towns and districts are moving to obtain a share of the bountiful supply of water that the Corporation of Manchester will presently bring from Thirlmere. We look with immense favour on this scheme, and believe it will be productive of the happiest results all along the line of the aqueduct. No time, we hope, will be lost in commencing the necessary works, which are destined to bring the blessing of a plentiful supply of pure water to millions.

A very pretty quarrel is brewing between the Thames Conservators and the Metropolitan Board of Works, anent Captain Calver's report to the former body, which represented that the condition of the river was being deteriorated by the deposition of mud brought up by the tide from the sewage outfalls. It is so pretty a quarrel, and looks so well upon paper at present, that we shall not pretend to interfere. A good deal of ink will be spilt, and much engineering and chemical ingenuity displayed, before any authoritative decision is arrived at; and what that may, in the end, be worth, none can foretell. That the Thames, between the bridges, is always muddy, is a fact patent to every beholder. It may be because the banks wash away; it may be, as Captain Calver reports, because sewage mud is carried backwards and forwards by the tides; in either case we shall hear so much of this matter, that we do not at present care to go further into the question. The Conservators of the Thames are a body who will not lightly bear contradiction, and Captain Calver is not the man to withdraw his recorded opinions, unless sufficient reason be shown that they are unfounded.



# A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLXIII.

PUBLIC LIGHTING (*continued*).

The system of lighting by means of the ladder and hand-lamp held its ground for many years. The hand-lamp began to disappear in the Metropolis about 1852, its duty being superseded by a bundle of lucifer matches, carried in the pocket of the lamplighter, the match being ignited by a scratch on the stand-pipe, while in the act of turning the cock. All these have been generally displaced by the torch and rod, which are represented in fig. 42, and consist of a small

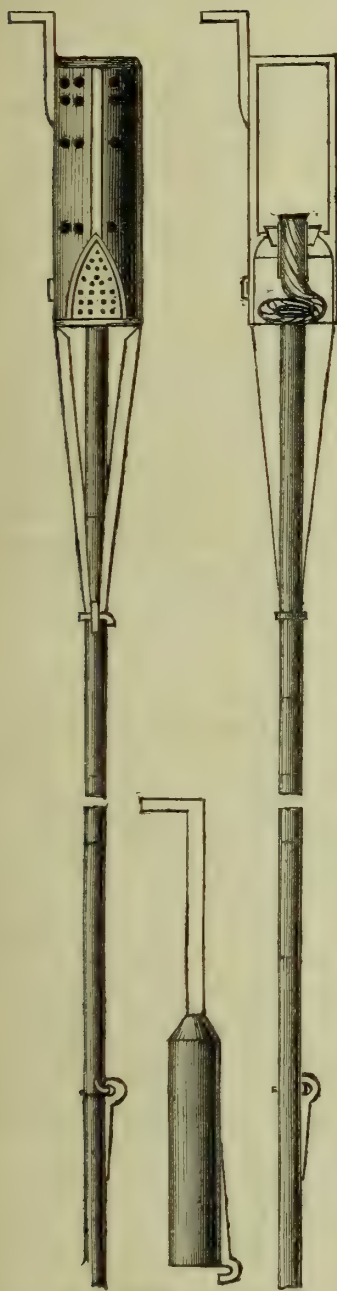


FIG. 42.

double-cased oil-lamp, made of tin or sheet-brass, about  $1\frac{1}{2}$  or 2 inches in diameter. The outer case of the shield is pierced with holes for the admission of air to the lighted wick, and the inner casing protects the flame from being extinguished by the wind. The shield is removable from the lower portion of the lamp forming the reservoir for the oil. The lamp-tap is turned by the projecting piece being forced against the lever arm, and on the lamp being inserted through the hinged flap, and its lower end placed opposite the burner, the gas entering through the small holes, seen in front, becomes ignited. The torch is then withdrawn, and the flap falls into its position as before. The wooden rod on which the torch is carried is usually jointed in the middle, for the convenience of the lamplighter, who separates it into two lengths when he has finished his round. For extinguishing the lamps, a small hooked metal top takes the place of the torch on the end of the rod. Hollow metallic rods, charged with gas in compression, are successfully used, instead of the oil-lamp, in some continental cities.

The usual number of lamps lighted by one man using the torch is 110. In streets where the lamps are placed near together, 120 may be lighted by one person. On the other hand, where the lamps are at the maximum distance apart, or where the levels of the district are extremely irregular, only 80 may be reckoned as the number.

Various plans of lighting the public lamps automatically have been devised from time to time, most of them exhibiting great ingenuity, but up to the present none of them have been entirely successful in overcoming the difficulties encountered.

The present system of lighting and extinguishing, notwithstanding the introduction of the rod and torch, which is a decided improvement on the ladder and hand-lamp, is both cumbersome

and expensive; but it has the element of certainty to recommend it, and it is precisely in this direction that most of the other plans proposed have failed. As a rule, the adoption of automatic lighting would show a saving in cost; but even if it were equally expensive with lighting by manual labour, it would soon supplant the latter and become general, provided that it could be depended on to accomplish the work without danger of failing, or, at least, with the minimum risk of failure. The further important advantage of uniformity in the times of lighting and extinguishing both metered and unmetered lamps, when the average meter system is in operation, would result from the introduction of any certain method of simultaneous ignition.

There is ample scope for the exercise of invention in the automatic lighting and extinguishing of the public lamps. That it will be eventually made to succeed, and at a diminished cost, there can be no question. Progress in this, as in other matters, is certain to be achieved; and one result of its accomplishment will be to give greater permanency to public illumination by means of coal gas, by enabling it the better to maintain its position in the race of threatened competition with other proposed methods of illumination.

One of the most ingenious inventions for this purpose is that of Mr. E. Price. This is represented in figs. 43 and 44; the former being a sectional drawing of the apparatus, and the latter exhibiting the method of its attachment to the lamp. The instrument, A, is

circular in form, having its inlet joined to the stand-pipe of the lamp. D is a flexible diaphragm; E, the valve in connection therewith; C, the gas passages leading to the burners, J and P. Access to the passage on the left side is only obtained by way of the valve, but gas is constantly present in the one to the right, to supply the small jet at the top, protected by the shield. On putting the apparatus in action, the small jet, J, is first lighted during the daytime, and the diaphragm adjusted by weights, so that the valve may remain closed at the maximum day pressure. As the time for lighting approaches, an increase of pressure is given at the gas-works, causing the diaphragm to rise and open the valve, when the gas flows to and escapes at the burner P, where it is immediately ignited by the small jet. Again, when the time of extinguishing arrives, the pressure in the mains is reduced, the diaphragm falls, closing the valve, and the light is put out. The small jet is kept constantly alight, but is found to consume but little above one-quarter of a foot per hour. One of Sugg's governors, N, is shown as fixed above; this, though not indispensable to its working, is a useful auxiliary to the instrument. The inventor has proved the efficiency of the contrivance by actual experience of its application to a district under his own supervision. The cost of the gas consumed by the small jet is more than compensated for in the saving of lamplighters' wages, and by the further

saving in the quantity of gas consumed, owing to the light not being turned on full until it is absolutely required.

The invention, of course, is not applicable to districts where the hours of lighting and extinguishing of the public lamps are not coincident with the putting on and taking off of the pressure; but other wise the apparatus has much to recommend its adoption, and in numerous other places besides the public lamps, it can be applied with advantage.

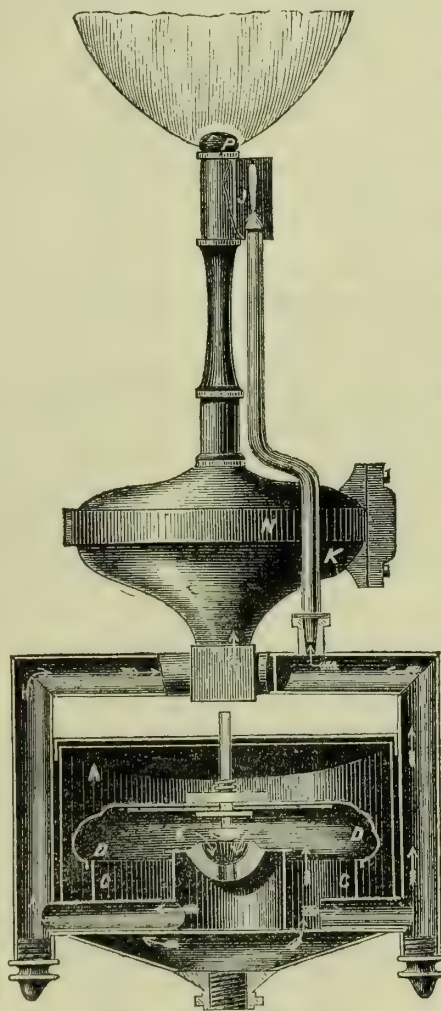


FIG. 43.

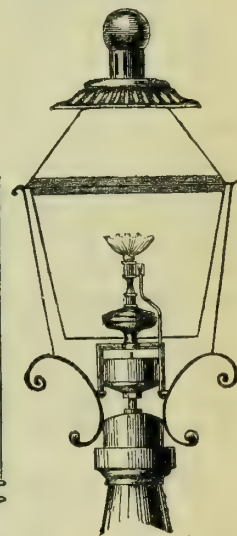


FIG. 44.

**DEATH OF MR. JOHN Z. KAY.**—The death is announced, on Tuesday last, at Genoa, of Mr. John Z. Kay, of the Phoenix Iron Works, Glasgow. A native of Balfour, in Stirlingshire, Mr. Kay early settled in Glasgow, where he started as a Mechanical Engineer. While still a young man he became the Manager of the New Gaslight Company, Dundee, and when the New and Old Companies became amalgamated, he was continued in office as the Manager, his term of service extending over the long period of 20 years. Fully ten years ago Mr. Kay was induced to become a partner in the firm of Messrs. Thomas Edrington and Sons. He was an old friend of the Trades House, Glasgow, in the management of which he took an active interest, and was a leading and active member of the Incorporation of Hammermen.

**PROPOSED EXHIBITION OF GAS APPARATUS AT BIRMINGHAM.**—The Gas Committee of the Corporation of Birmingham propose to hold an exhibition of gas apparatus in the Town Hall, from the 5th to the 11th of June next, and have issued circulars inviting suggestions with reference to the scheme. They state that their object is "to bring prominently before the public the advantages of employing gas for cooking and warming purposes, and they believe, from the promises of support which they have already received, that they will be able to form an exhibition which will interest the public, and will be also to the advantage of the exhibitors. The Committee desire especially to show that the use of gas apparatus for cooking and domestic purposes may be readily introduced into houses of all classes, with great advantage as regards economy, cleanliness, and readiness of control; but they also desire to show those applications of gas to trade purposes which are not generally known, and which will not only be interesting to the public, but valuable as suggesting economy to manufacturers and others in the further employment of gas." There will be eleven classes, and a silver medal will be given to the best exhibit in each of the classes. The exhibits will include gas cooking-stoves; apparatus for warming houses, baths, conservatories, &c.; other apparatus in which gas is used for domestic, manufacturing, or scientific purposes; gas-meters; and coke-stoves.



## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

## BIRMINGHAM CORPORATION GAS ACCOUNTS.

SIR,—In your issue of the 2nd inst. you published a letter, signed "Vindex," and, in another part of your JOURNAL, an extract from the *Birmingham Daily Gazette*, of March 7, having reference to this undertaking. I am instructed to ask leave to point out the inaccuracy of both these statements. "Vindex" states that the Corporation of Birmingham are now charging the consumers about £60,000 per annum more than was charged by the Companies. This is not so. When the Corporation took to the undertaking, the charges of the Companies were as follows:—Over 100,000 feet, 3s.; under 100,000 feet, 3s. 2d.; under 25,000 feet, 3s. 4d.; under 10,000 feet 3s. 6d. The Corporation charges are—2s. 9d., 2s. 11d., 3s. 1d., 3s. 3d., the discount being 5 per cent. for cash in both instances. The reduction in favour of the Birmingham consumers is, therefore, nearly £30,000 per annum.

The writer in the *Daily Gazette*, in his attempt to show that our prices are higher than those of other large towns, has taken the mean of our minimum rate in Birmingham, and our maximum rate in a small outlying district in which we are required, by our Act of Parliament, to charge 1s. per 1000 feet more than the rate charged to Birmingham consumers, and thus assumes that our average charge is 3s. 6d. per 1000 feet. He has overlooked the fact that our sale at the maximum rate is 7 millions, against 638 millions at the minimum rate.

Our sale to consumers last year was 2,242,056,200 cubic feet, and our receipts from this source were £336,789 18s. 10d., which, less 5 per cent. discount, gives an average price of 2s. 10d. per 1000 cubic feet.

I may add that it was not considered necessary to make this correction in Birmingham when the statement appeared in the *Daily Gazette*, as all the facts relating to the management of the undertaking are well known in the town. The Committee desire, however, that they should not be inadvertently misrepresented in your JOURNAL.

EDWIN SMITH, Secretary.

Old Square, Birmingham, April 20, 1878.

## TESTINGS FOR ILLUMINATING POWER AND THEIR DIFFICULTIES.

SIR,—A proper reading of my letter, in the JOURNAL of the 9th inst., might have saved my friend, Mr. Hartley, and your anonymous correspondent, W. L., P.B., their trouble in describing the correct methods whereby other important analytical processes in relation to coal gas should be conducted. But one moment's reflection will show that they do not touch the simple question I suggested for solution by a practical Gas Manager, and which bears closely on a subject of every-day use by him, but may be stated in simpler terms, thus: Given—A particular specimen of well-purified coal gas, showing by a good photometer an illuminating power of (say) 30 candles. Required—A correct formula to determine, from the ascertained candle power, the corresponding condensation by bromine, and the minutes duration of a cubic foot, under the durability test, due to such candle power. And *vice versa*.

Both of these inferential tests are much in use by Gas Managers. And the greater number of printed analyses of Scotch canal coals give prominence to the bromine and durability tests as having a qualitative relation to the illuminating power, but which puzzles as much as it enlightens. I give an example from three such reports on as many specimens of first-class Scottish canals. Each of the three reporters (carefully reducing all to the atmospheric standards of 30 inches and 60°) is a man of acknowledged ability and excellent judgment in determining the true value to the gas manufacturer of the minerals reported on. The only anomaly being the confusion which arises in any attempt to reconcile these two inferential tests with the actual candle power determined by the photometer. The figures below will speak for themselves:—

Analyst.	Name of Coal.	Condensation by Bromine.	Durability of 5-Inch Single-hole Jet.		Illuminating Power by Photometer.
			Min.	Sec.	
No. 1.	A	Per Cent.	70	00	Candles.
No. 2.	B	22-00	68	38	38-00
No. 3.	C	19-00	65	00	39-11
					36-01

Edinburgh, April 20, 1878.

JOHN REID.

## RULES FOR GAS-MAKING.

SIR,—I fully expected some of your able correspondents would have replied to the inquiry of "Q." in your issue of the 9th inst., wherein he asks for some rule how to make gas of high illuminating power out of ordinary Newcastle coal by reducing the quantity produced per ton.

In the course of my practice as the Engineer of gas-works abroad, I have been obliged to resort to every possible expedient to keep up the illuminating power of the gas when my stock of canal coal has run short. I believe I have made gas at every possible temperature, and from almost every variety of coal; but I have failed to discover any method by which a rich gas can be made out of an inferior coal. I account for this on the following principle:—The gaseous constituents of Newcastle coal are mainly light carburetted hydrogen, with a certain portion of olefiant gas, some free hydrogen, and variable portions of oxygen and nitrogen. The light-giving gases are, of course, the two first; these are more or less constant in quantity within a considerable range of temperature. The other light-giving constituents are those derived from the hydrocarbon vapours obtained by volatilizing the light oils and naphthas of the tar. At a mean temperature, or one capable of vaporizing these liquid hydrocarbons, the gas from Newcastle coal will contain its maximum amount of illuminating power. If the temperature sinks below this mean, these vapours are not rendered permanently elastic, but speedily become condensed, and pass as fluids along with the heavy tar, and are thus lost as illuminative agents; but

if, on the other hand, the heat is too high, some of these hydrocarbon vapours are decomposed, and become partially converted into light carburetted hydrogen, losing a portion of their carbon, which becomes solid, and adheres to the sides and roof of the retorts. If this idea be correct, it tends to show that it is a fallacy to suppose that by reducing the heats of the retorts, and thereby reducing the quantity of gas to be obtained from a given weight of coals below a certain mean, you must of necessity obtain gas of a higher illuminating power. If the heat is in excess, then the diluting gases are produced at the expense of the illuminative constituents; if the heat be too low, the hydrocarbon vapours are not volatilized at a temperature so as to render them sufficiently elastic to be carried along with the permanent gas.

I do not for a moment believe in the doctrine that all the constituents of the coal are broken up by the action of heat, or that they become so many atoms of carbon, hydrogen, oxygen, and nitrogen seeking to form new combinations. I believe that the gaseous and other compounds are permanently formed in the original plant, and that these compounds are, for the most part, retained in the substance of the coal, and are liberated in their compound character as soon as the compressing force is removed by the disruptive action of heat; and that it is because each of these compounds varies in different plants that, therefore, we have more or less gaseous compounds in each variety of gas coal, as we know is the case if we compare ordinary bituminous coal with rich cannel coal.

I do not offer this opinion as a dogma; I only offer it as an attempt to solve some of the difficulties Gas Managers meet with in endeavouring to account for anomalies in their working experience.

42, Pentonville Road, April 17, 1878.

HENRY GORE.

## HOW NOT TO DO IT.

SIR,—I happen to be the Manager of a provincial gas-works where I think the Directors do not manage the works in some respects on commercial principles, and I shall esteem it a favour if either you or your readers could throw a little light on the following case, which is a sample of several I have now on hand. There are twelve cottages requiring a supply of gas, and our gas-main is so near to those cottages that the income would be 50 per cent. on the outlay of extending the main. My employers will not make the necessary extension, on the ground that the distance from our main to the cottages is above 30 feet, as per clause 11 of the Gas-Works Clauses Act, 1871, which is incorporated with our private Act. What I ask is, Can a consumer compel us to supply him with gas, no matter what the cost of doing so, if he will undertake to guarantee us 20 per cent. on such cost, as per the same Act and a sub-section of the same clause? If you could refer me to any decisions on the point, I should be glad.

A COUNTRY GAS MANAGER.

## Parliamentary Intelligence.

## HOUSE OF LORDS.

MONDAY, APRIL 15.

The Examiners reported that the further Standing Orders applicable to the Bradford Water and Improvement, and the Nottingham Improvement (Gas, &c.) Bills have been complied with; and that no further Standing Orders are applicable to the Lewes Gas Bill.

Cockermouth and Workington Water Bill, Nottingham Water Bill,—read a second time, and committed.

Newry Gas Bill, Shrewsbury Gas Bill, Trowbridge Water Bill,—read the third time, and passed.

TUESDAY, APRIL 16.

The following Bills received the Royal Assent:—Batley Corporation Water; Brading Harbour District Gas; Deal Water; Dublin Corporation Water-Works Acts Amendment; Farnworth and Kearsley Gas; Hartlepool Gas and Water; Imperial Continental Gas Association; Sevenoaks Water; Shrewsbury Gas; Torquay Gas.

The Examiners reported that the further Standing Orders applicable to the Lea Bridge District Gas, and the Tredegar Water and Gas Bills have been complied with; and that no further Standing Orders are applicable to the West Houghton Local Board Bill.

Cardiff Water Bill, Newbury Borough Extension Bill,—brought from the Commons, read the first time, and referred to the Examiners.

Truro Water Bill,—read a second time, and committed.

Lichfield Gas Bill,—read the third time, and passed.

Marske and Saltburn Gas Bill,—read the third time, with the amendments, and passed.

A petition against the Nottingham Improvement (Gas, &c.) Bill was presented from Thomas Harrison.

## HOUSE OF COMMONS.

MONDAY, APRIL 15.

Cardiff Water Bill, Newbury Borough Extension Bill,—read the third time, and passed.

Hemel Hempstead District Gas Bill,—as amended, considered; to be read the third time.

Maryport Improvement Bill,—as amended, considered; amendments made; to be read the third time.

Burton-upon-Trent Commissioners Bill (Lords), York United Gas Bill (Lords),—read a second time, and committed.

Leicester Corporation Bill (Lords), Warrington Water Bill (Lords),—read the first time, and referred to the Examiners.

Gas and Water Orders Confirmation Bill,—“to confirm certain provisional Orders made by the Board of Trade under the Gas and Water Works Facilities Act, 1870, relating to Bognor Gas, Dysynni Gas, Elland Gas, Formby Gas, Godalming Gas, Greenhithe Gas, Sandown Gas, Shanklin Gas, Weston-super-Mare Gas, Alcester Water, Cuckfield, Hayward's Heath, and Linfield Water, Fowey Water, Frith Hill, Godalming, and Farncombe Water, Holywell and District Water, Newquay Water, Norwood (Middlesex) Water, Wokingham Water, Hoylake and West Kirby Gas and Water, New Tredegar Gas and Water, and Walton-on-the-Naze Gas and Water,”—was brought in by Mr. J. G. Talbot and Viscount Sandon, read the first time, and referred to the Examiners.

A petition against the Normanton Gas Bill was presented from the Normanton Local Board.

TUESDAY, APRIL 16.

Sutton-in-Ashfield Gas Bill (Lords),—read a second time, and committed.



Newry Gas Bill (Lords),—read the first time, and referred to the Examiners.

Petitions against the Castleford and Whitwood Gas Bill (Lords) were presented from (1) Charles Wheler Wheler and others, (2) Surveyors of Highways and Overseers of the Poor of Allerton Bywater and others, (3) Overseers of the Poor and Owners and Ratepayers of Fryston.

# HOUSE OF LORDS COMMITTEE.

FRIDAY, MARCH 29.

(Before Lord STRAFFORD, Chairman; Earl ROSSLYN, Earl AMHERST, Viscount HOOD, and Lord RIBBLESDALE.)

## CASTLEFORD AND WHITWOOD GAS BILL.

Sir EDMUND BECKETT, Q.C., and Mr. MICHAEL, Q.C., appeared for the promoters; Mr. TATHAM for the Methley Local Board, and for Messrs. Mitchell Brothers; Mr. PEMBER, Q.C., and Mr. W. H. DAVIDSON for Mr. Charles Wheler Wheler; and Mr. POPE, Q.C., and Mr. TATHAM for the Whitwood Local Board, petitioners against the Bill.

Sir E. BECKETT, in opening the case on behalf of the promoters, said the case would be a very simple one, in consequence of the withdrawal of what would have been a rival Bill had it been proceeded with. The present Bill was merely one of an ordinary kind, to bring under parliamentary control, and confer parliamentary privileges upon a Company who had hitherto carried on their business with the consent of the Local Authorities in Castleford and Whitwood, and had supplied gas to a certain extent in the neighbourhood of those places. The preamble of the Bill recited the manner in which the Company had been carrying on their business for some time past. In 1872 certain persons who had from the year 1851 been carrying on the business of a Gas Company at Castleford, together with others, formed themselves into a limited liability Company under the Act of 1862. The capital of the Company was now £30,000, the whole of which had been subscribed, and nearly the whole paid up, and they were in the happy condition of having no mortgage debt. The demand for gas had greatly increased, and more mains had been laid down, and consequently further capital was required. The remainder of the Bill was the form which was now almost stereotyped, in respect to price and the sliding scale, and all the ordinary provisions which were usually inserted in Gas Companies Acts in the present day. After describing the limits of supply as proposed by the Bill, the learned Counsel stated that Whitwood had become a place of so much importance that there was also a private gas supply in the hands of a gentleman named Briggs, who had not constituted himself in any respect as a Company either under the Limited Liability Act or anything else; but the promoters were willing to make an agreement with that gentleman that they would not interfere with his area of supply without his consent, although the time would very likely come when he would be anxious to sell his works to the Company. There was also another gentleman supplying a small portion of Whitwood, of the name of Mitchell. His works were less than those of Mr. Briggs, and the Company were quite willing at the present time to buy his works at a reasonable price, but he had not come to that conclusion yet, although Mr. Mitchell had once made an offer to the Company which was accepted, and then he receded from it. It was plain that a Bill like the present could not be affected by so small an opposition as that. Mr. Mitchell would be entitled to whatever their lordships thought justice, but that could not be the throwing out of the Bill, which was all they had then to consider. In addition to that there was the opposition of a gentleman who had tried to ripen his petition into an opposition by a landowner in the parish of Ledstone; but he would be in no degree affected by the construction of the proposed works, because the Company took no compulsory powers in Ledstone or Ledsham, and it was a matter of settled law that a mere extension of gas-pipes into a district, where a person's land was not interfered with, should not give him a right of opposition. It was proposed by the Bill to increase the present capital of £30,000 by the same amount, making the very moderate sum of £60,000. The Company were at present only in the condition of paying a dividend of 6 per cent., which was less than the authorized rate. He (Sir E. Beckett) did not think anybody could say the price inserted in the Bill as the standard was an unfair one, inasmuch as it would only enable them to pay a moderate dividend; and they were now intending to lay out a large sum in extending mains, and so on, which, of course, for some years would be unproductive. They also proposed to insert auction clauses in the Bill, although they were not bound to do so. With regard to the population of the district, it was rather difficult to say what it was at present, because it was continually increasing, but confirmation upon that point would be laid before the Committee. In respect to the supply of gas, the quantity delivered at present was 18 million cubic feet per year, which was a very considerable quantity; but when the alterations and extensions were completed they would be in a position to supply 30 millions. In addition to the private oppositions there was a public one from the Whitwood Local Board, who objected to being included within the proposed limits of supply, "inasmuch as your petitioners will be deprived of the rights which they now possess to supply gas, if they think fit, within the said district;" that was to say, if they went through certain processes, ripening ultimately into an Act of Parliament, because it must be remembered that a Provisional Order must so ripen, and it might be opposed either by Mr. Briggs or by the present Company with a competing scheme whenever they applied to Parliament. It was a standard doctrine of Parliament that no new Company and no Corporation should be authorized to supply gas or water in a place where there was an existing Company supplying it, but the Local Board proposed to override that doctrine, and asked practically to have the promoters turned out of Whitwood, in order that the Board might some day, if they thought fit, introduce a rival concern. The result of rejecting the powers now sought for would be that that part of Whitwood now supplied might be left altogether without gas, and yet those people, in order that they might have a little temporary authority, thought their opposition ought to prevail. The Local Board also said that if they wished "to buy that part of the undertaking of the Company within their said district, they will be compelled to pay a much larger price therefor, and thereby would incur a greater expenditure than would suffice for the establishment of gas-works of their own." If they did not mean to buy the works, they meant to stop the exercise of the Company's powers; but if they did mean to buy the works, they wanted to have the power to do so at a depreciated value should the Committee deprive the Company of the legal power to do that which they had been doing hitherto. The petitioners also submitted "that the principle embodied in the 161st and 162nd sections of the Public Health Act, 1875, is that the supply of gas in urban districts should be in the hands of the local authority;" but it was exactly the opposite, for the principle of that Act was that of prohibiting local authorities from supplying either gas or water, where there was already a supply in the district, without making proper arrangements with those who supplied it. Whether they could supply gas at a cheaper rate it was impossible for them to calculate; the probability was that they could not, inasmuch as the larger the supply the cheaper it would most likely be. The rest of the petition was merely formal, and there only remained Mr. Wheler's petition to be dealt with. The learned Counsel read several passages from that peti-

tion, and contended at some length that Mr. Wheler had no *locus standi*, inasmuch as the Company only proposed to carry their pipes along the public roads.

Mr. PEMBER handed in a map, showing Mr. Wheler's estate, and quoted several cases, which he contended were in favour of the *locus standi* of the petitioner.

After considerable discussion on the point, the Committee-room was ordered to be cleared. On the parties being again called in,

The CHAIRMAN said that the Committee were of opinion that Mr. Wheler had no *locus standi*.

The following evidence was then called:—

Mr. Richard Heptinstall, examined by Mr. MICHAEL.

I am a corn miller at Castleford, and pay a large amount of local rates there. I am also a large consumer of gas, and am Chairman of the Castleford and Whitwood Gas Company. The works of the Company, since 1872, have been much enlarged. The area of the site upon which the works are built is about 5000 yards, and adjoins the River Aire and Calder, which is very valuable to us, as it enables us to obtain our coal economically. We have 40 retorts, with the usual ascension-pipes and hydraulic apparatus, and likewise a station-meter. We have four gasholders, one of which is a very large one, only recently erected on a piece of land we purchased for the purpose. We have tar and ammonia water apparatus, and all other necessary works, which are kept in very good condition. We supply Castleford, Allerton, Bywater, part of Whitwood and Glass Houghton, and, I believe, part of Kippax. The district we supply contains about 12,000 inhabitants. Our consumption is increasing, and we have enlarged the works from time to time to meet the increased demands for gas. The management has been carried on economically, and we have charged as low a price as we possibly could. In 1873 the price was 5s. 2d., and the dividend then paid was 5 per cent. In 1874 the price was 5s. 10d., and the dividend 6 per cent. In 1875 the price was 5s. 7d., and the dividend 8 per cent. In 1876 the price was 5s. 2d., and the dividend 8 per cent. In 1877 the price was 5s., and the dividend 8 per cent. At present it is 4s. 7d., and the dividend 8 per cent., which is the highest we have ever paid. The directors are paid 10s. for attending the ordinary meetings.

In cross-examination by Mr. TATHAM, witness pointed out on the map the various localities supplied by the Company.

Mr. William W. Macvay, examined by Mr. MICHAEL.

I am a glass-bottle manufacturer, and ex-Chairman of the Castleford Local Board, of which I was Chairman for six years. I am a ratepayer and owner of property in both Castleford and Whitwood. My rates in the former are £1016, and in the latter £490. I am not in any way connected with the Gas Company, although I am supplied by them. I have 30 lights in my own house, 225 lights in the glass-works, and nine in the yard. At my works at Whitwood there are 21 lights. The Company also supply gas to the church. There are five lamps in the churchyard, and 225 in the church. There are also two schools, in one of which there are 175 burners, and in the other about 200. We have no reason to complain of the gas, and we have a very good supply. The price compared with other places of similar population is very favourable. I have also found the pressure of the gas very good, and am perfectly satisfied with the supply.

Cross-examined by Mr. POPE: A considerable portion of Whitwood proper is supplied by Mr. Briggs, and a small portion by Mr. Mitchell.

Mr. POPE: Can you mention any similar place to this which, within the last three or four years, has been put under parliamentary powers?

Witness: Pontefract. The population there is not so large as that of Castleford. It is a corporate town, and, I believe, the price per 1000 feet is 4s. 1d. or 4s. 3d., or something like that. I do not know whether they have the auction clauses and sliding scale there.

Mr. MICHAEL said he had a number of local witnesses; but as the Castleford Local Board had withdrawn their opposition, he would not trouble the Committee by calling them.

Mr. Francis Crabtree, examined by Mr. MICHAEL.

I am the Managing Director of the Castleford Gas Company. During the last twelve months we made about 19 million cubic feet of gas. The unaccounted-for gas amounted to 15-20 per cent. We have 48 consumers in the upper part of Whitwood Mere, and three in the lower. Whitwood and Castleford, although different in name, are one continuous line of streets. We have agreed not to supply in the district supplied by Mr. Briggs without his consent, and are willing to extend the agreement to Mr. Mitchell. We have spent a large sum of money in the extension of our works to meet the requirements of the Castleford Local Board. We have one or two large consumers at Whitwood, but the others are principally shopkeepers. I should think Mr. Briggs would supply rather more than we should in Whitwood proper; but, of course, we supply a great deal more than Mr. Mitchell does.

Cross-examined by Mr. POPE: We have no works in Whitwood; only the mains. We contract with the Local Board for the lamps which we light, and Mr. Briggs and Mr. Mitchell do the same. I should think the total amount of our rental derived from Whitwood is nearly £4000.

Mr. John Ford, examined by Mr. MICHAEL.

I am an owner of property in Castleford and Whitwood, and also a member and ex-Chairman of the Whitwood Local Board. I am quite content with the supply of gas by the Castleford Gas Company. A meeting of the ratepayers was held, under the Borough Funds Act, at which it was decided that the Bill should not be opposed; but a poll was subsequently taken, which resulted in a decision to oppose the Bill.

Rev. John James Needham, examined by Mr. MICHAEL.

I have been Rector of Whitwood Mere since 1868, and have been supplied with gas in my private residence, and also in the church. I have found the pressure and quality uniformly good, and have no complaint to make.

Mr. MICHAEL stated that the promoters had agreed with Mr. Mitchell, and, therefore, the Committee would not be troubled further with his opposition.

Mr. Robert Paulson Spice, examined by Mr. MICHAEL.

I have visited the works at Castleford on two occasions, and consider that they will require to be still further modernized than they are at the present moment. They came into existence many years ago, and have been added to from time to time. My opinion is that the business of the Company has been conducted economically, properly, and satisfactorily in every way. The retorts at the present time are a little too short for extreme economy; half of them are about 8 feet long, and the other half only 8 feet 6 inches long, instead of being 9 feet or 9 feet 6 inches. They stand in two stacks, instead of having them in one stack, back to back. The works also want a little more condensing power, and an increase in the purifying department. As things now stand, they are equal to present requirements; but the time has arrived when the manufacturing portion of the concern must be overhauled. Some of the mains require to be taken up and relaid by larger ones, as well as being extended into the surrounding districts. My notion is, and I have advised the Company to that effect, that a few thousand pounds more are required to be laid out to provide for the wants of the district properly, satisfactorily, and economically. The outlying portions of the district which is proposed to be included in the Bill could be more economically supplied from the existing works than from any small works which might be put up to



supply separate and detached portions. The works could not be better situated with regard to the supply of coal; they are central, and are on a low level. It must be obvious to any one knowing anything about the matter, that a small place like Whitwood could not manufacture and supply gas to compete with the Castleford Company. For instance, the same manager at Castleford would suffice for double or treble the quantity sent out. I think the amount of capital asked for is within the usual limits; it is a common rule to double the capital when applying to Parliament. When the auction clauses are introduced, there is no inducement for a company to spend capital; on the contrary, there is an inducement to extreme economy, because there is a better chance of consolidating and securing the interests of the original Shareholders. The amount of dividend to be paid becomes a matter of no importance; if it is 10 per cent. a larger amount of money is paid for the shares, which goes into capital, receiving no dividend, so that practically it brings it all to a limit of between 4 and 5 per cent. My opinion is that if Gas Companies were allowed—under the new legislation as to auction clauses and sliding scale—10 per cent. instead of 7 per cent. upon the new capital, it would be better for the consumers. With regard to the standard price fixed by Parliament as compared with the price charged at the time a Company apply for a Bill, I think that there ought to be a margin allowed, and that has been the practice of Parliament. The object of this is to meet any contingencies in respect to coal or the labour market. The amount of unaccounted-for gas is quite within what I should expect in such a district. In 1877 the cost of coal per 1000 feet was 13s. 5d. net; the residuals produced 7s. 3d., and the net for coal was therefore 6s. 12d. The working expenses amounted to £1368 5s. 2d., which equals 23d. per 1000 feet of gas sold. Adding 23d. to 6s. 12d. gives a final result, as the net cost per 1000 feet sold, of 29s. 12d. I think the account presented is a fair one; the only thing is that it is a little in excess of what is usual for the maintenance of works. I have seen the coal used at the works, and it is not a first-class coal. By more skilful adaptation there may be a little more gas eliminated, but that would not materially affect the result. The "wear and tear" amounts to about 2d. per 1000 feet, but possibly a reduction of this amount will be practicable with additional economy when the works are revised. With regard to how much is required to pay 10 per cent. dividend on the capital of the Company, I have not thought of that, because last year the profits amounted to £1380, which is equal to 7½ per cent. on the capital.

Mr. MICHAEL: Take the amount paid in dividend at 7½ per cent., and tell me how much requires to be added to the cost price you have given, in order that we may arrive at the selling price?

Witness: The price calculated for gas sold last year was 52s. 32d., which is 4s. 4d. and one-third of a penny, while they were selling gas at 5s. per 1000 feet, allowing a small discount for cash.

All that is asked for here is 10 per cent. upon the old capital and 7 per cent. on the new?—Yes.

Unless larger profits are earned, you cannot pay more than 7½ per cent. on the price which is now charged?—It is not possible to pay as much as 7½ per cent. on the price now charged, for that is 6d. per 1000 feet less than it was in the year ending June 30, 1877.

I believe that out of the 4s. 7d. a discount is allowed for prompt payment, and that reduces the dividend below 7½ per cent. 7½ per cent.—Yes.

So that taking 4s. 7d., if no fresh capital is spent, the most that could be hoped for is 7½ per cent.?—No; the most that could be hoped for is 6 per cent. The profits I have spoken of were earned when gas was sold at 5s. per 1000 feet, and that equalled 7½ per cent.

If fresh capital is expended in the extension of the works, that will further reduce the dividend unless you have a larger supply of gas to look to?—Yes.

And you look to an extension of the district to give you that larger supply?—I look to two things—that is, the larger supply and an increased rental, and an increased amount of economy resulting from the expenditure of £3000 or £4000 upon the works.

What do you say is the smallest standard price for gas that you can ask for in the interest of the Company?—The price that ought to have been asked for is 5s. per 1000 feet; but with a view to preventing opposition, and so saving the expense of a contest, I advised them to insert 4s. 7d. as the lowest price that could be asked for.

Examination continued: With respect to Whitwood, it can only enure to their advantage to be joined on to this Company; and not only so, but it would be to the advantage of the whole district.

Cross-examined by Mr. POPE: Having regard to the quality of the coal used, the production is not much out of the way, although it might be increased, and that is one of the economies which is possible. The amount of capital per million feet of gas sold ranges between £500 and £2500, but all the circumstances of each case must be taken into consideration.

Mr. POPE: Give me a liberal allowance for gas-works suitable for such a district as this. Shall I say 14s. per 1000 feet?

Witness: It might be 18s. per 1000 feet. The result of my experience is that capital is never extravagantly expended in these cases, and that it is impossible for a Company to have too large a capital when the circumstances of the case necessitate a liberal amount of capital to be invested. In certain circumstances I have given 12s. as the proper amount to calculate for a small Company; but if the state of the case is such that the old works have to be swept away, and new works built, the capital has to be doubled. Without exceptional circumstances, 14s. would be a liberal allowance.

Looking at their statement of accounts for June 30, I find they divided 8 per cent., and not 7½ per cent. It says, "Payment of a dividend of 8 per cent."?—I do not see how they paid 8 per cent. out of 7½ per cent. profit, except, it may be, that all the capital represented there was not called up from the beginning of the financial year. If £1000 or more had been paid up in the last three months, they would have had those three months of dividend at the rate of 8 per cent.

Your calculation was based upon the earnings of 1877; is it not, therefore, fair to take the capital of 1878 and the earnings of 1877 in calculating the dividend, because I suppose you have not spent further capital in 1878 without making further earnings. Fresh capital means fresh profit, does it not?—No; you may have to spend capital before you get profit.

What is the amount of the reserve-fund of the Company which has been laid aside out of profits besides paying dividends?—I do not know that it is laid aside at all; it is a very common thing to have a reserve-fund named in a balance-sheet, but it does not exist as a reserve-fund—it floats as a general asset, and is an undivided portion of profit.

Re-examined by Mr. MICHAEL: It is not fair to take the sum which would be expended in very large gas-works, and then calculate and apply it to small works of this kind. All the capital expended on these works is fairly represented by what is called the structural value of the concern.

Mr. George Wilson Stevenson, examined by Mr. MICHAEL.

I designed water-works and drainage-works for Castleford 25 years ago. The standard price asked for gas in the Bill—4s. 7d.—is, in my judgment, a fair price. I agree with Mr. Spice that it is desirable that this district should be supplied with gas from one works, which would be more economical than if Whitwood had the power to supply its own gas. Whoever supplies Whitwood with gas will have to arrange terms with Mr. Briggs and Mr. Mitchell before they can occupy their districts.

Mr. MICHAEL: Does Parliament ever allow public funds to be brought into competition with private capital?

Witness: There has been one single instance in which it was done by an error, but it was corrected in the ensuing session of Parliament.

With regard to the universal practice of Parliament, do you know of any single instance in which Parliament has allowed a Gas Company or a Corporation, or a Local Authority, to come in and supply gas when there was an existing Gas Company to supply it with or without parliamentary powers?—No; I know of no instance at all.

As to the amount of capital expended on these works, is that fairly represented by the works themselves?—Yes. I may say, as to some part of the works, that they are in excess of the present requirements.

Therefore the money which has been expended is with a view to future extensions?—Yes. A portion of a gasholder cannot be built at a time. The whole must be finished, and that runs into a great deal of money.

Examination continued: We are not asking for any new rights, but we are simply placing ourselves under parliamentary restrictions in the district we now occupy.

Cross-examined by Mr. POPE: The amount of storage at present is about 230,000 feet, which is nearly double the present sale.

Mr. POPE: Then what do you want increased capital for?

Witness: Two of the gasholders ought to be done away with, as they are too small for the present amount of business done there. That would reduce the contents by 25,000 feet, and would still leave practically 200,000 feet of gasholder room, and in that direction diminishes the necessity for expenditure of further capital. The retorts, however, require remodelling. Mr. Spice said that from £3000 to £5000 should be immediately expended, but I do not think it would be quite so much.

It seems to me inevitable that we must arrive at this conclusion, that, inasmuch as by producing double the quantity you cheapen the gas, you will get the gas at a less cost of production for an expenditure of £3000 or £5000 immediately of capital?—Yes; very much so. To make a sale of double the quantity of gas will not require double capital.

But it will very largely cheapen the production of gas?—Yes; as the business extends the cost of gas will be reduced. Still the great cost of gas-making is the coal—the raw material from which gas is made.

Re-examined by Mr. MICHAEL: Considering that the auction clauses are to be introduced, I do not think it can be a grievance to apply for powers to raise this large amount of capital with those clauses. Still the Company could do with less capital than they ask for, although that would involve them in applying again to Parliament in a short time, and the expense would eventually come out of the pockets of the consumers. The price of 4s. 7d. will only give the Proprietors a dividend of 7½ per cent. on the capital already existing, and if £5000 were added it would further diminish that amount. It is only by very extensively enlarging the supply of gas that the price can be cheapened.

Mr. William Wilson, examined by Mr. MICHAEL.

I am a Gas Engineer, residing at Castleford, and have managed the gas-works of the Castleford and Whitwood Gas Company.

Mr. POPE said he had no question to ask the witness.

Mr. Alfred Penny, examined by Mr. MICHAEL.

I have made a structural valuation of the works of the Castleford Gas Company, and I believe the sum that has been spent is fairly represented by the structure itself. The district is a growing one, and capital will be required to extend both the mains and the manufacturing apparatus. The standard price proposed is perfectly fair, it being a price which is supposed to have some elasticity about it, to provide against a recurrence of what happened a few years ago—viz., a very large increase in the price of coals, iron, and labour.

Cross-examined by Mr. POPE: If I were to go closely into the working statement which has been presented, I should say a small deduction might fairly be made from the cost of maintenance. When the price of coal and iron is very low, I think that—although I admit that the cost of maintenance is a little in excess—some small margin might fairly be allowed for a possible and probable increase in the price of coals, iron, and so on; therefore I should not disturb the 10d. per 1000 for maintenance.

Mr. POPE: Dealing with the question of how the capital should be expended, and what is necessary for such a Company, I am satisfied that you will agree with me that 14s. per 1000 feet is a liberal expenditure?

Witness: No; that is not the result of my experience. If you are dealing with large works I agree with you; but when you are dealing with comparatively small works, where the whole make is 17 or 18 millions, I do not agree with you. I agree with Mr. Spice to the extent that £18,000 has been properly spent, and it is represented.

Do you agree with Mr. Spice that, unless exceptional circumstances be shown, 14s. per 1000 cubic feet is a liberal capital allowance?—Yes, I agree with him; but I say there are exceptional circumstances here, and the small quantity of gas made is one of them. Another is that some portion of the works is largely in excess of present requirements.

Supposing the shares were put up to auction, at 7 per cent. dividend what premium would they realize?—That would depend on the view of the inhabitants as to the stability of the concern.

Re-examined by Mr. MICHAEL: The Company take the coal of the district, and that produces the results shown in their books. If they were to use a coal that produced more gas, they would have to pay more money for it.

Mr. MICHAEL: Is there anything you have heard here which at all disturbs the 4s. 7d. as a fair price for gas?

Witness: No; there is nothing. It would be the interest of the Company to work economically; if they do not, they cannot obtain their dividend. If they were paying 10 per cent., and asked for the standard they are doing, there might be something said; but they are not. They must work with great economy to maintain their present position, and all the money to be further expended will require additional economy.

This concluded the case on behalf of the promoters.

Mr. POPE, on behalf of the Whitwood Local Board, requested that the Company might not be clothed with statutory powers within the area of the Local Board; but assuming that the Committee should arrive at the conclusion that the Company should be empowered, under statutory powers, to supply a portion of the district, then he asked their lordships to say that 4s. 7d., as a standard price, was too high, and that such a price ought to be fixed as might secure to the Company a fair and reasonable dividend upon their present and future capital, but no more. The Castleford Company were seeking to become a statutory Company, not supplying the whole district covered by the Local Board of Whitwood, but only a portion of it, excluding that portion privately supplied by Mr. Briggs, and buying up that portion now supplied by Mr. Mitchell; but when once a Company were established under statutory authority, the rights and duties of the Urban Authorities became limited. The Local Board of Whitwood would, therefore, be in the position that they would have certain rights in one part of their district, but not in another part, thus creating inconveniences which the Public Health Act of 1875 was passed with a view to remedy. Why should the Castleford Company seek to come into the Whitwood district clothed with statutory powers? The Local Board of Whitwood said they were contemplating the supply of gas within their own area, but they would be met with the difficulty that they



would have to purchase, not only those who were supplying that district, but they would have to encounter the opposition of a statutory Company beyond that district. They would never be able to undertake the supply of Whitwood as the Urban Sanitary Authority, without dealing with the Castleford Company—no longer as a Company without statutory power, who could be reasonably bought, but as a Company with those statutory powers to whom an enormously increased value would be given. It need not be pointed out how important it was, if possible, that there should be one united body within a district; it would be exceedingly irksome to the Local Authority that there should be two bodies within one area exercising authority over the roads, for instance. The Committee would doubtless agree that no harm could be done by striking the Whitwood district altogether out of the Bill. There were only 51 consumers out of 800 who would be at all affected by it. The Castleford Gas Company would lose only that portion of their supply; but the remainder they might have, dealing with it as the Local Authorities of the districts to be affected would allow them. Another question was, What ought to be the standard or initial price of the gas? Of course, if their lordships thought it right that the Whitwood Local Board should be excluded, he (Mr. Pope) had nothing to do with that matter.

The CHAIRMAN: Before going to the question of price, let me ask whether the Whitwood district is supplied at all with gas by Mr. Briggs and Mr. Mitchell?

Mr. POPE said that a portion of the township which belonged to Mr. Briggs was supplied by that gentleman. Mr. Mitchell also supplied the Local Board by agreement, and the price for the public lights supplied by the Castleford Company was also agreed upon by the Local Board and the Gas Company. His argument, therefore, went to show that, though it was quite true that it would exclude from the district, under statutory powers, the Castleford Company, it would not limit the power of the Local Authority in Whitwood to agree with all or any of those gentlemen who were at present supplying gas within that district. But not only so; it would place them in the advantageous position of having three supplies to which they could go. If Mr. Briggs was willing to agree to extend his mains along their roads at a cheaper price than the Castleford Company, the Local Board could say, "Mr. Briggs, come and supply the district." But if the Castleford Company obtained statutory powers within a certain portion of the district, neither Mr. Briggs, nor Mr. Mitchell, nor the Local Board would have authority to interfere. If, however, the Committee should be of opinion that the powers sought within Whitwood should be given, then they came to the question of standard price. If there were a *bonâ fide* auction, the capital would be issued at a price which would represent the public estimate of the value of the undertaking. But the object of the sliding scale, and the standard price, was to take care that the consumers should not have to pay for reckless expenditure of capital, or for careless management of the gas-works. The fixing of the standard price, therefore, was the only guarantee the consumers had that the capital raised would be legitimately and properly expended, and the works economically managed. The case for the Local Board was that the Committee were dealing with a small concern; but it was a concern which was going to be doubled by the expenditure of new capital, and the simple question was, what amount of capital could be economically and legitimately invested, in order to produce gas for the benefit of the consumers, so as to yield the investors 7 per cent. They might take the accounts presented as a fair working statement, and assume that the amount which the gas cost was 2s. 6d. per 1000 feet; and then, in order to fix the standard price, only one other element remained to be considered—viz., what was the amount to be added to that 2s. 6d., in order that the properly expended capital of the future and the past might earn 7 per cent. It was well known unless exceptional circumstances were proved, an expenditure of 14s. per 1000 feet was a liberal calculation. If that were so, then to pay 7 per cent. upon the capital so invested would require 1s. Add 1s. to the 2s. 6d. would make 3s. 6d., and not 4s. 7d., which would represent an investment of capital of 29s. per 1000 feet, instead of 14s., which Mr. Spice admitted, unless there were exceptional circumstances, would represent a liberal allowance. That was rather a question of calculation than of evidence, and Mr. Bramwell could be called to present to the Committee the calculations he had made on the subject. The Local Board, therefore, said 3s. 6d. was the extreme standard price, while the Company said it should be 4s. 7d.; but, before that subject was considered, he (Mr. Pope) hoped the Committee would understand that his clients objected to being included in the district at all.

Mr. John Richardson, examined by Mr. TATHAM.

I am a Civil Engineer, and agent for Lord Mexborough's Yorkshire estates. I know the Whitwood district intimately. The portion of that district supplied by the Castleford Gas Company could be easily supplied by either Mr. Briggs or Mr. Mitchell. No portion of the Gas Company's works are in Whitwood at all.

Mr. Frederick Joseph Bramwell, examined by Mr. TATHAM.

I have heard the evidence given by Messrs. Spice and Penny, and, if the Company are to have the extended district, no doubt new capital is necessary. I cannot agree or disagree with their statement as to the existing capital, because I have not sufficient knowledge of the works. As to the standard price, there is only one item remaining open, which is the amount that should be allotted for profit, because the statement given as to cost—a little under 2s. 6d.—is one that is accepted as a fair statement for an average of years, taking all things into account. The question, therefore, is, what should remain for profit? If 4s. 7d. is to be the standard price, 30d. deducted from it leaves 25d. for profit per 1000 feet. The present capital is not all paid up, and they ask for £30,000 of new capital, which is to be sold by auction, at a premium of 40 per cent., as suggested. I had supposed that the premium was to be added to the amount, whereas I believe it will be included in the amount. If I take it as included in the amount, there is a second £30,000, and then they have borrowing powers of £7500 on the first £30,000—one-fourth of the capital called up. That will make a total capital, by the time it is all called up, at that rate of premium, of £72,750. Of that £30,000 will bear interest at 7 per cent.; £21,420, which represents the par value of the shares that must be sold at 40 per cent. premium to yield £30,000, will bear interest at 7 per cent.

Mr. MICHAEL: You have taken, to begin with, 7 per cent. instead of 10 per cent. for the existing capital of the Company.

Witness: The Bill asks for 7 per cent. upon both capitals.

Mr. MICHAEL: You are wrong upon that. It is 10 per cent. and 7 per cent.

Witness: Then I shall have to make a fresh calculation, but taking it as I have done for the present, there is £30,000 at 7 per cent.; £21,420 at 7 per cent.—that is, after deducting from the other £30,000, £8580 premiums derived from auctions bearing no interest at all, and £12,850 borrowed money at 4 per cent., which comes to £512. The total amount to be paid, therefore, in the way of dividend and interest, is £4110, and that would be satisfied at the rate of profit asked for of 25d. per 1000 feet, by the sale of a little under 40 millions a year, which is all that is made at an expenditure of £72,000, which represents as much as 36s. per 1000 feet upon the gas sold, and is an exorbitant rate of capital.

Mr. TATHAM: What is the normal rate, and are there any peculiar circumstances in this case?

Witness: I know of no peculiar circumstances beyond the fact that labour and materials are cheaper than in other districts. I consider 14s. per 1000 a fair and liberal amount for works of this magnitude. When I say "works of this magnitude," I am not considering them as they are at present, but what they will be when all the capital asked for is expended. These are works wherein I should expect to find 100 millions per annum made, instead of 40 millions. I therefore say that under these circumstances, in my judgment, 14s. per 1000 is a very fair and liberal allowance, and that is 7 per cent. That comes to 1s., and 1s. added to 2s. 6d. makes 3s. 6d., instead of 4s. 7d.

The CHAIRMAN: Do you know of any other Companies who charge the sum you suggest—3s. 6d.?

Witness: I know of gas being sold as low as that—actual sale, not initial price.

Mr. MICHAEL, in replying upon the whole case, said there were only two points to discuss—first the price, and then whether or no the Whitwood Local Board should be excluded from the operation of the Bill. Had the Committee heard a single argument with respect to the exclusion of Whitwood? No attempt had been made to controvert the assertion of the witnesses called by the promoters to show that the inclusion of Whitwood, instead of an injury, would be an absolute benefit. What was the present position of matters. There were a Gas Company without statutory restrictions, and without the only advantage which accrued from putting a Company under parliamentary sanction—that was to say, without the power of breaking up the streets. That was the only advantage they would have in exchange for the whole of the restrictions of the Gas-Works Clauses Acts of 1847 and 1871. The Company at present could earn 20 per cent. if they liked to charge 7s. instead of 4s. 7d., because there was nothing to prevent them; and if it happened that at any time the Whitwood Local Board wished to purchase them (it was an inevitable necessity that before they could supply gas they must buy out the whole of the persons or bodies supplying gas in their district), they would have to meet the Company, and the basis of purchase would be the amount of profit earned by the Company. The principal inhabitants both of Whitwood and Castleford had given evidence that the Company had done their duty well, and had supplied good gas, and no witnesses had been called to prove any complaints against them; and the only alleged grievance was that the consumers would have to pay more if the Company had parliamentary powers granted to them. The Committee, however, would see that it must be much more economical to supply gas within a large area than a small one, where all the expenses would fall upon the small district. Before the Whitwood Local Board could obtain power to supply gas within their district, they must get a Provisional Order, which must be sanctioned by Parliament, and they could then only obtain the power by purchasing the whole of the undertakings, whether of persons or companies, who were supplying gas within that district. If the Committee passed the Bill excluding Whitwood, the circumstances would be entirely changed. The church, the schools, the public lamps, and the private consumers deriving their light from the Company would be entirely deprived of that light, because the Company would be exceeding their powers if they went beyond the ambit of their district. Were their lordships prepared to assent to the proposition that those persons and institutions who were now so well supplied should be left without light at all? With respect to the price of 4s. 7d. not a single word had been said against it, except the supposition that at some distant period, when the whole £72,000 had been raised, there would be an amount which, if calculated into the supposititious quantity of gas to be supplied at that distant period, would come to a larger amount per 1000 feet of gas than ought to be allocated to the capital. The Company asked for 4s. 7d., which would only give them 7 per cent. upon the present capital, while they were entitled to 10 per cent., which would bring it up to 5s. 5d. Further capital was required in order to meet the wants of the district, and the raising of that capital would operate for a long period in deduction from the dividend which was at present being derived; therefore, a less sum than 7 per cent. would accrue to the Company on that 4s. 7d., until, by economical working and extension of works, the Company would be able to recoup themselves. It seemed also to be forgotten that, in cutting down the profits of the Company, the amount of premiums which would go into the capital would also be reduced. If the price were fixed at 3s. 6d., the result would be that the Company would earn only 3 or 4 per cent. instead of the 7 per cent. which had been named, but no person would be found to purchase the capital, and the Company would have to fall back upon their original Shareholders in order to raise the money necessary for the conduct of the undertaking, and the premium of 40 per cent., which would otherwise accrue, would be lost, and would fail to reduce the price of gas. The point for the Committee to consider was, had the capital been expended *bonâ fide* in the conduct of the undertaking? If they were satisfied that it had, that the works had been economically conducted, that an efficient supply had been provided, and that 4s. 7d. was a price which was required to pay the moderate dividend of 7 per cent. on the old capital and 5 per cent. on the new, their lordships would not hesitate in giving the promoters what they asked—that was to say, the extended district, and such a price in the future as would enable them to earn a fair dividend upon the capital expended on their works.

The room was then cleared. After some time the parties were called in, and

The CHAIRMAN said the Committee had decided to pass the preamble of the Bill.

The clauses were then read and agreed to, and the Chairman was directed to report the Bill, with amendments, to the House.

#### HOUSE OF COMMONS COMMITTEES.

TUESDAY, APRIL 2.

(Before Mr. LEATHAM, Chairman; Viscount HOLMESDALE, Mr. RALLI, and Mr. CHESTER MASTER; Mr. A. BONHAM-CARTER, Referee.)

#### LEA BRIDGE DISTRICT GAS BILL.

Mr. CRIPPS, Q.C., and Mr. RICHARDS, Q.C., appeared for the promoters; Mr. ROUND, for the Walthamstow Local Board; and Sir MORDAUNT WELLS, Q.C., for the Leyton Local Board and Consumers of gas within the district of Leyton, petitioners against the Bill.

Mr. CRIPPS, in opening the case for the promoters, said that gas legislation had made considerable progress of late years. Only a short time ago Gas Bills had been opposed on the ground of monopoly, but it seemed strange at present to find an agitation of that kind coming up again. It had been found that opposition in gas supply was almost impossible, and that it was better to establish it as a regulated monopoly. In the year 1860 the matter was fully discussed with regard to the London Companies. They had competed one with another in certain parts of London, but the inconvenience of that course was intolerable, and it eventually led to combination. The Companies applied to Parliament for sanction to what they had done among themselves, and at the same time to submit themselves to those regulations which Parliament thought fit to impose. More recently, the Metropolitan Board sought for general powers with reference to the London Gas Companies, and a device was established by which the evils of monopoly could be obviated—that was, by regulating the dividend according to



a price charged. It was stated that the public had no control over the Companies, and if they could divide more than 10 per cent. they would be extravagant, because they had no interest in the public prosperity. Parliament, however, said, "We will impose the sliding scale; if you can reduce the price of gas 4d., you shall be entitled to divide an extra pound of dividend, and *vice versa*;" and so care was taken that all Companies should conduct their affairs with economy. That being the general state of affairs, the Lea Bridge Company came before the Committee to ask for parliamentary sanction. Up to the present they were a chartered Company; they had no parliamentary authority, and Parliament had no hold at all over them. The facts of the case were that some years ago the West Ham Gas Company obtained power to supply a district, part of which would be the district now lighted by the Lea Bridge Company. It appeared that the locality there was very difficult to supply, and the West Ham Company seemed to have taken the best portion of it. A company were subsequently formed for the purpose of supplying the part not lighted by the West Ham Company, but were not successful; they went into bankruptcy, were sold and resold, and were ultimately bought by the Company now applying for parliamentary powers. More recently an arrangement was made, by which the Company gave up some leasehold land to the Great Eastern Railway Company, and obtained some freehold land in exchange. From the year 1868 they had gone on very prosperously; but it might very well be imagined that when gas-works were taken which had been in liquidation, they would be in a very bad state. The whole of the capital of the Company was £35,000, and they had also £7000 borrowed money. For some years the West Ham Company did not light the district, although they might have done so at any time; and it was very unreasonable that, when the Lea Bridge Company had cultivated the district, the West Ham Company should step in and reap all the benefit. An agreement had, however, been arrived at to the effect that a line should be drawn, that the Lea Bridge Company should supply the portion they had hitherto supplied, and the West Ham Company confine themselves to the district they had supplied. That agreement, or rather a modification of that agreement, was one of the matters which would be opposed. The district was different from West Ham; they had a more sparse neighbourhood and longer pipes, and could not there supply gas at the same price as West Ham; and it was not an unnatural thing that the parties in the neighbourhood, seeing the West Ham Company supplying gas at a lower price, should envy the position of their consumers, and think it very desirable that the West Ham should come in there. In asking to place themselves under parliamentary legislation, of course the Company applied for powers which would last them for a certain number of years; they also asked for a sum of £65,000, which would be sufficient for a reasonable length of time. He then referred to the auction clauses, and said the effect of them was that the Company had no interest in raising a farthing more than they had occasion for, but were interested in being as economical as they could, because they obtained no benefit whatever from the new shares. They also came under an important provision as to illuminating power, and proposed to supply 14-candle-gas—not quite so high as the Metropolis—but it could hardly be said that a place like Walthamstow required the same as London. At present they were not bound to give gas of any standard at all; and, therefore, in putting themselves under these regulations, there was, in point of fact, a lowering of price. With reference to the standard dividend and standard price in the Bill, they had hitherto been charging 5s. 6d., and, therefore, took that as the standard; but there seemed to be so much objection, that they would endeavour to start with the lower price of 5s. The petitions which had been presented were founded upon a want of consideration of what had been determined by recent legislation. He then read several extracts from the Walthamstow petition, and referring to paragraph 8, "objecting to the standard rate of dividend being fixed at 10 per cent.," he said the Company would be quite willing to fix the dividend on the new capital at 7 per cent., which would be sufficient to ensure its being taken up. One paragraph in the Leyton petition was to the effect that by the agreement between the Companies a monopoly was secured which it was unadvisable to allow, and that the powers sought were more for private expediency than for public advantage. Upon that point he joined issue with his learned friend. He did not think that allegation would be endorsed, or that it would be made an objection to a Gas Bill at the present day that it established a monopoly. If it were sought to establish a new Company where there was one in existence already, it was well known that there would not be the slightest chance of Parliament allowing anything of the kind. The matter was tried many years ago, and it was found to be an absolute failure. The only thing was for Parliament to confirm and regulate the monopoly. The only instance of a new Company being allowed where there was one already in existence was in the case of Limerick 15 years ago; but there they went on quarrelling and disturbing everybody in the town till last year an Act was obtained for the amalgamation of the two concerns, and that would be the inevitable result of any two Companies supplying the same district. The petitioners also alleged that they would be subject to a monopoly by a Company who sought for large powers and high rates, and on public and private grounds they complained the more of that because they believed that the existing works in the parish of Leyton would be materially increased, and consequently the nuisance would be increased also. It might be mentioned that an Act of Parliament was applied for by the Company some years ago, which was opposed by a gentleman in the neighbourhood, on the ground that the works would be a nuisance to him; but an arrangement was arrived at. The works were removed a short distance off, and there was no question raised about that matter now. Then they said there was no public necessity, and that the preamble was untrue, and that, if any Act was required, provision should be made for compulsorily lighting all roads in the district, and carrying out the undertaking in its entirety for the public benefit and advantage, but that was a question of clauses.

Sir M. WELLS: There is no clause in your Bill about lighting the public roads. I suppose it is an omission.

Mr. CRIPPS said he did not think there was any occasion to do so, but if there was any necessity it should be inserted. As regarded both petitions, neither of them could be regarded as very hostile or very severe. The interests of the Consumers and of the Company were identical under the new arrangements made by Parliament, and he trusted the Committee would pass the Bill, which would be as great a benefit to the Consumers as to anybody else.

The following evidence was then called:—

Mr. John Birch Paddon, examined by Mr. CRIPPS.

I have been Chairman of the Lea Bridge Gas Company from their commencement, about ten years ago. The works were erected some time before 1853, but I do not know precisely when. There were difficulties in the early inception of the matter, but the works came into the possession of Messrs. White and Hulett in 1860; they were then transferred to the County and General Gas Company, who went into liquidation in 1868; then Mr. Stephenson Clark purchased the works from the liquidators, and almost immediately sold them to the present Company. Some land, in addition to the site, at that time was granted under a new lease by Mr. Warner, for 81 years from June, 1868. Our works adjoin the Great Eastern Railway, and the Company took possession of our land

compulsorily under the powers of their Act. They eventually gave us a similar piece of land on the other side of the works, which placed us in a better position than we were in before, because the land taken from us was leasehold, while that given to us was freehold. I do not know a place in the locality so well adapted for the manufacture of gas. I do not think it is likely we shall have any residential property near it. Since we purchased the works a great deal has been done in extensions and renewals; scarcely any of the original plant remains. At the present time the works are in a very defective condition, but should the present Bill pass we shall be able to keep pace with the increasing demand for gas. I do not think the agreement between the West Ham Gas Company and the Lea Bridge Gas Company was scheduled in the Bill of 1864. Another agreement has been made since then, by which the streets themselves were constituted the boundaries between the two Companies, instead of the boundaries running down the middle of the streets. Up to Dec. 31, 1877, we had raised by the issue of shares £30,775, and we had also raised £7000 on debenture bonds. The price of gas was originally 6s. 6d.; then it was reduced to 5s. 6d.; but during the coal famine, in 1873, it was again raised to 6s. 6d. From that time it has been brought down, by a series of small reductions, to the present selling price of 5s. 6d. The profit divided has never exceeded 6 per cent. from the establishment of the Company to the present time, nor has it been less. The main object of the Bill is to dissolve the old Company, and re-incorporate it as a statutory Company, which can only be done by bringing ourselves under all the requirements of the public Acts with reference to gas legislation. At present we have no limitation as to price, except by the operation of such annual contracts as we may have entered into with the Local Authorities. If we gave gas of a worse description, no one would have any remedy against us, and if we gave an insufficient supply, and selected our consumers here and there, we might do so in the absence of any restrictions, so that the imposition upon us of the ordinary statutory restrictions would be of enormous advantage to the consumers. I do not know of another district so important as this where the supply of gas is unregulated at the present time. Our increase of business has been very rapid indeed. I think the Act of 1871 furnishes sufficient regulation for the purpose of street lighting. The price of gas as originally inserted in the Bill was 5s. 6d., but after a great deal of consideration we have reduced it to 5s., and we trust the Local Authorities will be satisfied with that. I have a list of similar undertakings, and it appears by comparison that 5s. is very low. The price of coal is continually varying, and that governs the cost of gas. I think the sum asked for in the Bill—£65,000 of new capital—is a proper amount to apply for, because provision is generally made for about twelve years. Our present production of gas is about 30 millions feet; but we have doubled our production within the last eight years, and there is every probability of our doing the same in the next eight years. Taking the capital outlay requisite for the manufacture and distribution of one million feet of gas at the present time, and applying that to the future, it appears that this new capital will make provision for the sale of about 87 millions in addition to what we make now, and that will exhaust the capital powers asked for, I think, in about twelve years. Of necessity we place ourselves under the new regulation as to auction clauses in the raising of that capital. Under those clauses there will not be the slightest inducement to the Company to spend more capital than they ought; on the contrary, there would be an inducement to spend the money sparingly. New capital is wanted entirely for new business; and if there be no new business there will be no expenditure of new capital. As to the quality of the gas, we propose 14 candles, which is the standard almost invariably given to Companies of this description. The Local Authorities have no power to compel the West Ham Company to supply the Lea Bridge district; the agreement is something entirely independent of them. Of late years it has been the practice of Parliament to draw a marked distinction between sparsely populated districts and those districts where the consumers are very thick together, and where they are near the works. Most Companies have two districts of these kinds. The West Ham Company have very wisely got rid of their incubus in that way, and they have, I believe, chiefly a well-populated district; but in the case of the Brentford Company the price in their home district is 4s., and in the outlying district 5s. 6d. In Brighton the home district is supplied at 8s. 6d., and the outlying district at 5s. 6d. Supposing the Local Authorities had the power of compelling the West Ham Company to supply our district, they could not do so at the price charged to their own consumers. The price of 6s. seems to be very common in places where the quantity of gas made is greater; and where the gas can be made and distributed more favourably than in our district. In the Christchurch Act, passed last session, the price was fixed at 6s. 6d.

Sir M. WELLS objected to the evidence, unless the witness was acquainted with the localities to which he was referring.

The CHAIRMAN said he did not think there could be any objection to the evidence.

Examination resumed: In the Southend Act, passed last session, the price was 6s.; in the Horsham Act, 7s. 6d.; and in the Farnborough Act, 7s.

Cross-examined by Sir M. WELLS: We made an application to Parliament in 1873, and our Bill was rejected, but I do not know what was in the minds of the Committee. I do not think the sole reason was on the ground of the agreement we had entered into with the West Ham Company, although that might have had some influence. Our price at that time was very high. I think it is most likely that the agreement was a profitable one for the West Ham Company, but it could scarcely be a disadvantage to the persons so taken over, although it would be to those who remained in our hands. It is not an anomaly for a parish to be split up into two portions; it is a thing of frequent occurrence. I know a number of instances where parishes are so split up, and where the price of gas varies very much indeed. It is only a short time since we had a striking illustration in the Metropolis, where two Companies were engaged, and the difference was very great between them. There are two adjoining parishes—Woodford and Chigwell—in which a similar arrangement was made, between the West Ham Company and those districts which were too far away for the West Ham Company to supply. Excepting for the agreement, that Company would still have had power to supply the whole of the Leyton district. The renewal of the works is not caused so much by their being worn out, as that they are outgrown. I am not prepared to accept a less price than 5s. in the Bill. There are certain circumstances under which perhaps we might see our way to something below that sum, but those circumstances would require to be very fully stated.

Cross-examined by Mr. ROUND: Unless other circumstances were favourable, I am afraid I should not be able to accept a price of 4s. 6d.; but I could not decide that matter myself—it would be a question for the Directors. We now charge 5s. 6d., and we divide 6 per cent., and if we accepted 4s. 6d., it would leave us almost without any dividend at all. In 1856 Parliament determined that the Walthamstow district should be assigned to the West Ham Company; but from 1868 that district was supplied by the Lea Bridge Company, the West Ham Company having very strong reasons for not furnishing a supply. Our application to Parliament in 1873 was simply to clothe ourselves with parliamentary powers,



and also to confirm our agreement with the West Ham Company, and our present application is confined likewise to those two points. Walthamstow is fast growing into a largely-built suburb of London; but I cannot tell the nearest point to which the mains of the West Ham Company approach it. There have been no well-founded complaints about the quality of the gas. Our Shareholders have twitted us at the meetings on the subject, but there was no ground for what they said. They spoke more as consumers than as Shareholders, their interests as consumers being considerable. Our district is a very large one, some mains towards the remote part of it being small; and occasionally during the rapid increase that has taken place, the supply has not been all that could be desired. It has been a little deficient, and, with nine people out of ten, a short supply of gas means bad gas; but all complaints have been promptly remedied as soon as possible after they came to the knowledge of the Company. Some people gave up burning the gas, but they have since returned to it. We have no difficulty in obtaining coal; we buy it under contract, the same as other Companies. Our longest contract has not exceeded twelve months. I cannot tell you the price at this moment, but for 1877 the cost delivered into our works was 18s. 11-32d. per ton for the best Newcastle coal coming by screw steamer to London, and delivered as near to our works as possible. We have a siding from the Great Eastern Railway, but we do not use it to any great extent. The price I have given includes barging, carting, dues, and expenses of every kind. The highest price we have ever paid was 30s. 11d. per ton.

Re-examined by Mr. CHAIRS: The alteration of the boundaries between the two Companies only affects the Lea Bridge Company to an infinitesimal extent, and it would be impossible to put it at any figure. Having one main and getting the streets supplied by one Company was a great advantage to the people on the side of the street that was yielded up, and the disadvantage to any one would be quite inappreciable. If Walthamstow increases, the consumers will have the benefit, and that is one of the advantages of the sliding scale. In the same way, any adversity must be shared between the Consumers and the Company. The latter would not raise the price of gas unless they were compelled to do so, and they would make a reduction as soon as they possibly could. One advantage from our siding is that, should anything interfere with our present mode of supply, we have that to fall back upon. We have used Yorkshire coal, but not to any great extent. The Great Eastern Railway Company are now promoting a Bill which will enable them to bring us some of the best coal, and we wish them success.

By the COMMITTEE: Our present illuminating power is about 14 candles, the variation not being much either way. There has been an accumulation of undivided profits during the last ten years of £2568, after paying the dividend of 6 per cent.

By the REFEREE: During the last year we used 3040 tons of coal, which cost us £2879, or about 19s. per ton. The cost per 1000 feet of gas sold was 25-01d. The total quantity sold was 27,627,000 feet. From the coal we obtained residual products which realized £1249, or about 10-85d. per 1000 feet sold. If that be deducted, it will leave, as the cost of the coal, £1629, or 14-16d. per 1000 feet. Then we pay for purifying materials £46 12s., which is equal to 40d. per 1000 feet. Our rents, rates, and taxes amounted to £487, or 4-24d. per 1000 feet sold.

By Mr. RICHARDS: That 4-24d. includes the rent of our leaseholds.

By the CHAIRMAN: Directors and Auditors, salaries, and commissions amounted to £953, or 8-28d.; wages paid, £589, or 5-13d.; bad debts, £36 11s. 6d., or 32d.; trade charges, wear and tear, maintenance, stationery, incidentals, and so on, £1529, equal to 13-28d. per 1000. The total amounts to £5026, or 45-81d. per 1000. The amount received was £7757, the difference being the profit available, and it is a shade under 7 per cent.

By the REFEREE: I think the population of the district is between 15,000 and 20,000.

Mr. Alfred Penny, examined by Mr. RICHARDS.

I knew the Lea Bridge district when the gas-works were first built, more than 30 years ago. I have recently examined the manufacturing plant and apparatus of the Company for the purpose of this inquiry, and I consider the works are very conveniently situated. The land scheduled in the Bill, on which they stand, comprises nearly four acres; it is not situated near any good residential property, and, therefore, it has all the elements for an increase in the works without being a nuisance. The plant and machinery have been almost entirely reconstructed since I previously visited the works, and the operations of the Company are carried on with skill and economy. Under the powers of the West Ham Company's Act, the district might have been supplied by that Company. The population is very small compared with the district which the West Ham Company supply.

Mr. RICHARDS: Perhaps that may be the reason why they did not, in fact, supply it?

Witness: At the time these works were first erected the West Ham works were on a very small scale, and were quite incapable of reaching that distance to supply the district. When the West Ham Company obtained their first Act, if the Lea Bridge Company had appealed to Parliament, there is no doubt they would have been exempted from the West Ham Company's district, but they failed to do so; therefore, it is clear the Lea Bridge Company were supplying that district before the West Ham Company had parliamentary powers at all. It is a very common thing for Companies to enter into such arrangements. I can remember many instances in which Gas Companies under parliamentary powers have given up a portion of their districts which could be more easily supplied by other Companies.

They give up a district that does not pay them, and allow another Company to take it?—A Company take in a large district which they are not able or willing to supply, and when that district grows into some little importance, being still out of their reach, they refrain from exercising their power, but agree with some Company to supply it. I have been in some such cases myself; one was that of the Imperial. I was acting at that time for the Hornsey Gas Company, and Hornsey was within the limits of the Imperial Gas Company, but they were very unwilling to supply gas, it being inconvenient for them to do so. I applied to the Imperial Company, and received from them a letter in which they agreed that they would allow us to supply that district, and they would not interfere with us. That happened again at Uxbridge. We had parliamentary powers there which covered the district of Southall, but it was not convenient or it would not have paid the Uxbridge Company to extend their mains so far, and we agreed with another Company to allow them to supply that district. It occurred again in the Harrow district. The Brentford Company had a very wide district, which reached close up to the parliamentary district of the Harrow Company; but there grew up, in fact, an outlying portion of the Brentford district, which we could supply conveniently, and we made an agreement with them by which the Harrow Company supplied that portion of the district with gas, and we do so at the present time.

It is a benefit to the public living in this thinly-populated district to get gas which the Company, to whom Parliament have allotted the district, declined to supply them with?—It would be a question of waiting a long time, or not getting gas at all. The Lea Bridge people could not have had any gas for many years after the time at which they did, if they had waited till the West Ham Company were in a condition to supply them.

Examination continued: I think the capital asked for is reasonable, looking at the case by the light of what has been done in other districts. I can remember when the West Ham Company had a capital of about £4000 or £5000, and when they made, perhaps, 5 or 6 million cubic feet of gas; now they make 200 or 300 million feet. Their district has grown enormously, and no one can tell what a suburban district will grow to. In this Bill the auction clauses are introduced, and, therefore, it is a matter of the smallest possible consequence whether the capital is £50,000 or £500,000. Under the old system, when the new capital was issued *pro rata* to the existing Shareholders, and where the rate of dividend was a good one, no doubt it was a benefit to the Shareholders; but it ceases to be so now, because the public will come in and buy the shares. In the case of a well-regulated Company paying fair dividends, the shares will realize a sum that will not give the purchaser more than about 5 per cent. At the same time, I do not think the amount of capital asked for in this Bill is at all excessive, having regard to the growing wants of the district which they have to supply. It is now pretty well understood that Companies have to bring themselves under the review of Parliament once in ten or twelve years. In my opinion, this capital will be used up in that time. I think the standard price is a very moderate one; it will give the Company barely 5 per cent. upon their present working. At 5s. 6d. they have only been able to divide 6 per cent., but for the past year they have earned nearly 7 per cent.

Mr. RICHARDS: If you take off the 6d., it will then reduce the profits below 6 per cent.?

Witness: No, it is not worked out in that way. If 6d. is taken off the profit, working it out in the per centage, it will bring the return or dividend to about 5 per cent.; and if the Committee were to do what I have heard spoken of in this room—namely, to bring it down to 4s. 6d.—it would reduce the dividend to 2½ per cent. I have made a calculation of the cost of gas at the consumer's meter per 1000 feet, which I find to be 45-71d. I exclude from this cost the sum for interest which I find the last witness included, and which I did not think was a proper thing to do. It would, however, practically come to the same thing, because I have a sum of 1s. 9-82d. left as profit, out of which I reckon dividend and interest. The dividend on that amount comes to 5 per cent.

That would give as the selling price 5s. 7-59d. ?—Yes; that would be the gross profit. That includes the price they receive for gas, and something for meter-rent, otherwise the price they have charged to consumers has been 5s. 6d., which, in my judgment, for such a district, is moderate. If the price is reduced to 5s., the loss falls on the Proprietors; because, instead of having an opportunity of dividing 7 per cent., they could only divide 5 per cent. With regard to the illuminating power and pressure, I find in the Bill all the clauses for the protection of the consumers which modern legislation has prescribed. It will be a long time before the Company can derive any benefit from the sliding scale, because they are not able to pay their maximum dividends. It has been stated very often that Gas Companies have no interest in using any economy after they are once able to pay their maximum dividends, and I presume the sliding scale has been created for the purpose of giving them an absolute interest in economical working; because, if by care, skill, and economy, they can reduce the price below the standard, they get a benefit from it concurrently with the consumers.

Comparing this district with that of West Ham, is it impossible to light a thinly scattered district like that of Lea Bridge so economically as a concentrated district like West Ham?—The districts are not comparable. The West Ham have one consumer—the Great Eastern Railway—who take as much gas as the Lea Bridge Company make altogether.

Complaints are made in one of the petitions with reference to the existence of an agreement between the West Ham Company and the promoters; do you think those complaints are well founded?—They are well founded in this respect, that it is something we may expect when people are exposed to competition close at home; otherwise we might go all over the country and make the same comparisons. I dare say some of the inhabitants in Walthamstow and Leyton think it hard that their neighbours should only pay 3s. 9d., while they have to pay 5s. 6d.; but still, in the nature of things, it cannot be helped.

The Leyton petition says that there are not sufficient powers contained in the Gas-Works Clauses Act to protect the Leyton Local Board; but are they not as well protected as any other Local Board in the kingdom?—I always had the impression that public bodies were amply protected by the Acts of 1847 and 1871. I know of nothing to prevent them from compelling the Gas Company to supply every lane or street in their district.

Cross-examined by Sir M. WELLS: The population of Walthamstow is increasing, and has been ever since I knew it.

Sir M. WELLS: Supposing that the Committee decide upon 5s. as the price, there is a prospect of this largely populated district being placed for about 15 years at a disadvantage, in reference to West Ham, of the difference between 5s. and 3s. 9d.

Witness: You hardly state the case fairly. The maximum price at West Ham is 4s. 6d., and they have reduced it by the operation of the sliding scale to 3s. 9d., and we should hope to do the same.

You are aware that, upon the general investigation which took place in reference to London, the Committee reported that the price should be 3s. 9d. ?—Yes; but this is not London.

Notwithstanding that, when the South Metropolitan Company applied to Parliament it was lowered even more than that?—I do not think the two places are at all comparable, although, as a matter of fact, it was so. The only Company in London, however, who had a standard price of 3s. 6d. was the South Metropolitan, who were, before that, charging 3s., and who have now gone back to that price under the operation of the sliding scale.

Supposing the Company raised additional capital, paying only 6 per cent. upon £30,000, as they do at present, would it not be an inducement to them to raise the price of gas, so as to get up to that standard dividend?—It might be, but inasmuch as they have had the power to do that all these years, and they have only increased the price when circumstances compelled them to do so—that is to say, in the coal famine—I think there is nothing to justify us in supposing they would do it now; in fact, it would be perfectly suicidal for them to do so.

I suppose in this case there is more than a probability of a very large population being shortly in this district?—Yes; I think the place will increase now that they have railway communication with London.

A favourite locality in the outskirts of London, like Walthamstow and Leyton, is not to be compared with outlying districts in remote parts of the kingdom, is it?—Not now; the whole circumstances have altered from the time when the West Ham Company were not in a position to light the district.

As the Lea Bridge Company are now coming to Parliament, is not this a proper time at which a fair adjustment should be made between them and the public?—I think so; that is always the case.

And one of the circumstances to be mainly considered is the future condition of the populations of these two districts?—I think the Committee might fairly be asked to consider the condition both of the Company and the district. This Company have spent a large sum of money in giving



great public convenience to the district, and I think they ought to be considered somewhat as well as the district itself.

The difficulty has arisen, has it not, from the circumstance of there being the Lea Bridge Company competing, as it were, for a portion of the district originally given to the West Ham Gas Company?—It is not exactly so, because the original works were erected before the West Ham Company had any parliamentary power over the district at all, and it is entirely by the *laches* of the Lea Bridge Company that they are placed in this position now. It is perfectly well known to the learned Referee that if that Company had come to Parliament when the West Ham Company were here asking for parliamentary powers, this district would have been excepted. It was their folly that has placed them in this position.

Do you see anything in the position of that portion of the Leyton district which is given over to the Lea Bridge Company, to afford any reason why they ought to be subjected to 5s. as against their neighbours who only pay 3s. 9d. in their own parish?—I do not see anything in it *per se*, but it is a thing not uncommon. To take the West Ham district itself, a portion of the parish of West Ham is supplied, by a similar agreement, by the Commercial Gas Company; it is a thing that cannot be avoided.

Supposing the Committee pass this Bill, the effect will be to place that small proportion of the parish at the disadvantage of having to pay 5s. as against 3s. 9d.?—I cannot put it as a disadvantage to one part, although it is an advantage to the other part; one portion of the parish has an advantage which the other part has not.

In addition to that, have not we a disadvantage, in that small district, of having the gas-works?—It is no disadvantage now, because the works are being conducted properly, and there is no nuisance arising from them.

There are residences of considerable size within a quarter of a mile of the gas-works, are there not?—The gas-works can be conducted so that they shall be no nuisance to anybody 500 yards off, or half that distance.

That has not been the feeling throughout the country with respect to gas-works?—No, because gas-works have been conducted very improperly in many instances.

Mr. RICHARDS said there was no allegation in the petition that the works were a nuisance.

Sir M. WELLS said he would not press the point.

Cross-examination continued: One reason why the Company are able to conduct their works without being a nuisance is that they have a large area for their works. If they were closely confined, as some works are, they would become a nuisance from necessity. I do not know that the bargain between the parties was made behind the backs of the inhabitants; it is a long while ago since it was done. I see no reason to object to the agreement on public grounds, provided the parties agreed to it. I do not think the public are damaged by it, but I think that one portion of the parish of Leyton is very much benefited in being supplied at a lower price than the other part.

Sir M. WELLS: Do you think that where parliamentary powers have been given to one Company, owing to the *laches* of another Company, a portion of the parish ought to suffer?

Witness: It was not this Company who made the *laches*—it was their predecessors. I know that the County and General Gas Company, who were taken over by the present Company, had a most wretchedly conducted concern. The district was, in the first place, so sparse, and the consumption so small, that the proprietors received nothing for their money. I was employed by the liquidators to value all their works, and I know pretty well the condition of things; they were all as bad as could be, and it is only since this Company have taken possession of the works that they have been able to get any return for their money.

Cross-examined by Mr. ROUND: The consumers make their appearance at the present time, many years after the arrangement was made by which they have been benefiting all this time.

Mr. ROUND: We have heard that within the last four or five years Walthamstow has very materially increased in population, and therefore, though it might not have been worth the while of the West Ham Company to supply the district in 1871, it might be worth their while to do so in 1878 under the altered circumstances?

Witness: It might be if they had the power to do it, but they have put it out of their power to do so.

An arrangement was made in 1864 for a period of four years, which expired in 1868, and between that time and 1871 there was nothing done. But apart from that, looking at the agreement, I see this, "Whereas the period for which parliamentary privileges were granted to the County and General Gas Company expired in 1868;" therefore they have no parliamentary powers after 1868, and, consequently, this particular agreement expired in that year. Then, in 1871, came the agreement which the Company ask to schedule now?—You will forgive me saying you are talking of something totally different. You are referring to the Act which the County and General Gas Company obtained for a limited period. That is not what we are talking about, which is the agreement with the West Ham Gas Company.

Supposing West Ham now found that Walthamstow would be a more profitable place to supply with gas than it had been, they would be precluded by the agreement from coming there?—Yes.

If that agreement were out of the way, the West Ham Company might think it worth while to come and supply Walthamstow?—I do not think the Legislature would sanction a dishonourable act like that. The Lea Bridge Company would never have placed themselves in the position they now occupy but for that agreement.

Supposing the agreement not to receive parliamentary sanction, it is possible that the two Companies might agree to rescind it?—I do not know, I am sure. I cannot go into the future.

Re-examined by Mr. RICHARDS: The agreement has proved very much to the advantage of the whole district, inasmuch as they were able to get gas at a time when they could not have got it from the West Ham Company. If the West Ham Company were to come into the comparatively thinly populated district occupied by the Lea Bridge Company, they could not supply gas at as low a price as they now charge in their concentrated area. They would be obliged to raise their price, and, under the sliding scale, they would then have to reduce their dividend.

Mr. RICHARDS: May we not look to the ordinary motives that actuate human nature, and believe that the Company would be prone to charge as low a price as they could, and take as high a dividend as they could, within the limits permitted them?

Witness: They would do so. The West Ham Company have reduced their price and increased their dividend. I think the price of 5s. now asked for by the Lea Bridge Company is extremely moderate. In the Londonderry Gas Bill last session the Committee gave 5s. 9d. as the standard price. There is a long boundary of something like three miles between the two Companies, but it is a district which is not filled up.

Mr. Edward Henry Thorman, examined by Mr. RICHARDS.

I have been Engineer to the West Ham Gas Company for about 31 years, and was the founder of the works. I remember the works of the Lea Bridge Gas Company from the time they were originally constructed, and the various hands they have passed through to the present time. I agree with the other witnesses as to those works being in good order, and of modern construction. There has been an agreement existing for some

years between the West Ham Company and the Lea Bridge Company, by which the latter light part of the district we are entitled to light under our Act of Parliament, but which we would have nothing to do with, because it did not pay. The effect of the agreement was that a large number of people were supplied with gas at a period when otherwise they would not have had gas at all. It is not possible to conceive that gas can be supplied in the district of the Lea Bridge Gas Company at the same price as it is in West Ham. I think the price proposed is quite reasonable. Taking the make of gas, it is a comparison between 80 millions and 230 millions. Our price at West Ham was 5s. and 5s. 6d., when we were not the size of the Lea Bridge Company; but the operation of the sliding scale has been to reduce that price to 3s. 9d. If we were, in violation of our agreement, to go into the Lea Bridge district, we could not supply the district for 3s. 9d., because it would take away the profit. For the purpose of lighting Walthamstow it would cost something like £10,000 for plant; it is spoken of as a populous place, but a great portion of it is fields. It is a long straggling parish; in some parts the houses are pretty thick, and then comes a large space with very few houses at all in it. The price asked for is moderate compared with other suburban districts of the same character, and 14 candles is the usual illuminating power.

Cross-examined by Mr. ROUND: I see no reason for increasing the price we at present charge—in fact, we hope to supply it cheaper. The price of 4s. 6d. was in our original Bill, when we were allowed to pay 7½ per cent. dividend. We obtained a second Act for an increase of capital, and it was then the sliding scale was incorporated, by which we could charge 4s. 6d., with 7½ per cent.; 4s. 3d., 8 per cent.; 4s., 9 per cent.; 3s. 9d., 10 per cent. We were in a position, directly the Act was obtained, to reduce our price to 4s. 3d., and consequently we raised the dividend half per cent.

Mr. ROUND: How far did this agreement form an item in the consideration for which the Lea Bridge Gas Company bought the old Company?

Witness: Not in any way whatever. I was present during the whole of the transaction—in fact, the agreement originated with me. I do not think we were wide-awake enough at that time.

Was the reason the West Ham Company never supplied Walthamstow because you would have to lay down a long line of mains through an unprofitable district?—Yes; a trunk main. I should think it would be about a mile and a half to the railway station at Walthamstow from our farthest point of supply, but we are not in a position at that point to supply any large demand. We supply Woodford, but there is quite a different neighbourhood to go through, and a very different class of customers to deal with. Our charge at Woodford is 3s. 9d.; we must supply all at one price, or less the dividend must be altered.

Cross-examined by Mr. GALE: My son was Manager at those works before the Lea Bridge Company existed. I know every one of the Directors of that Company, and they are not connected in any way with the West Ham Company.

Mr. GALE: In recommending the 5s. price and the 3s. 9d. price, you advised that the Leyton people should be left out in the cold.

Witness: It is hardly fair to put it like that. The line was specially drawn to keep all this populous district to West Ham, leaving the district farther away for some one else.

Could you subdivide the value of the property between the two districts, the 5s. and the 3s. 9d.?—I could not do that. We have a population in West Ham of 120,000, and then there is the parish of Leytonstone and Woodford, which we go into.

By the REFEREE: In the return of the West Ham Poor Law Union in 1871, the population is stated to be 62,000, but it has doubled since that time.

Mr. RICHARDS said that was the case on behalf of the promoters.

(To be continued.)

FRIDAY, MARCH 8.

(Before the Marquis of LOBNE, Chairman; Mr. STARKEY, and Mr. ERNEST NOEL; Sir JOHN DUCKWORTH, Referee.)

CHELTHAM WATER BILL.  
CHELTENHAM CORPORATION WATER BILL.

(Continued from p. 596.)

The cross-examination of Professor Ansted was resumed. He said he had not personally gauged the springs in the Chelt Valley. He took the gaugings of the Company's Engineer, and these were made in 1865. Believed the measurement of the springs already taken by the Water Company was about 350,000 gallons. Knew the Prestbury Spring. It was a copious spring; but, like all springs in the locality, it was liable to a large accession of volume after heavy rain, and a rapid decline in dry weather. The same remark applied to the Leckhampton Spring. The Corporation reservoirs were proposed to be some distance below the issue of the springs, where the volume would be considerably larger than at the head. The Prestbury Spring turned a mill immediately below its source. As the result of a careful analysis, he said that the sewage of Worcester would be completely oxidized by the time it reached Tewkesbury. He had given evidence in the Stockton case. He then said that there was no contamination of the water by sewage, the sewage coming into the stream from a little town above Barnard Castle; about 22 miles above. Notwithstanding this, the Committee decided against the taking of the water from the Tees; but he did not know the Committee's reasons. By oxidation all decaying matter was destroyed. Supposing germs to be living organisms, he thought it quite possible that they might be destroyed by oxidation. As far as he was a judge, he thought analysis of water proved that a much less run than seven miles made water which had received sewage a potable water. Below the influx of the Teem the water was a practically pure water. He did not know whether, supposing the germ theory to be correct, analysis would detect the presence of germs. There might possibly be disease communicated by the drinking of water which analysis showed to be pure; but there was no more danger than there might be said to be of chimney-pots falling upon people's heads in the streets. It was a remote one.

Re-examined by Mr. BIDDER: He considered the drainage area of the Chelt an inferior gathering-ground for drinking water; and that, if there were anything in the theory of germs, it would be as possible that they should be conveyed, and not destroyed by oxidation, if washed into the stream from the manure or other contamination. He did not remember the Prestbury mill precisely, but believed that the mill was a small one, and that the water was artificially retained by a mill-dam. As to the Stockton case, the volume of the Tees was much less than that of the Severn; and, in addition to the objection raised as to the quality of the water, there could be no doubt that the Corporation proposed an alternative plan of a very sufficient character, which was not the case in this instance. The theory of germs was that their existence could not be detected by analysis. Analysis did not detect their existence. Supposing disease to be conveyed by germs, still experience showed that the water at Tewkesbury was a wholesome one, by the condition of the health of Tewkesbury. [The witness pointed out to the Committee, upon a model of the Chelt watershed, the position of the springs proposed to be taken by the Corporation, and explained the manner in which, while the water



from the colitic gathering-ground on the top of the Cotswolds broke out towards the Thames Valley, only a small portion drained towards the Chelt, breaking out in springs through the lias.]

By Mr. BROWNE: The model was a distorted one in the sense that the vertical section, as compared with the horizontal one, was exaggerated. The water in the Chelt Valley percolated through the strata to their outbreak. It was understood that the earth oxidized water sooner than any other agency. He did not mean to say it was probable that disease would be conveyed by germs coming into the stream through the land.

Dr. Odling, F.R.C.P., and Professor of Chemistry to the University of Oxford, produced analyses of the water taken at Tewkesbury reservoirs. The water he considered to be singularly bright and beautiful, and quite wholesome and fit for town supply. He had given evidence before the Rivers Pollution Commission, and prepared analyses of water for that Commission. His evidence was in favour of the suitability of river water as a source of town supply. As to the report of the Commission that not more than two parts of carbon in 100,000 should be found in drinking water, he could not adopt a theory which would discard half of the water now in use for drinking purpose. The water of Loch Katrine and Lake Thirlmere contained nearly twice the average organic carbon to be found in the water of Severn. Loch Katrine water had an average of .179; Bala, .222; Thirlmere, .194; Hawswater, .158; Ullswater, .069; Severn, .155. The nitrates in the sample of Severn water he took were .24, but no damaging inference was to be drawn from this fact. As to the quotation from the Rivers Pollution Report, he might say that it was only the opinion of one chemist, though a very eminent one—none better—but when the view expressed in the quotation came to be discussed afterwards, by persons having special knowledge, it was not adopted. The Duke of Richmond's Commission had decided that the Thames water was good water, suitable for the use of the people of London.

Cross-examined: There was dissatisfaction with the water of London in some quarters, and an attempt was being made to obtain drinking water from another source. He believed the volume of the Thames where the water was taken was, in very dry weather, 400 million gallons, and that the Severn at Tewkesbury, in similar times, was about 90 million gallons, but he presumed that both these estimates were exceptional. He gave evidence against the Company in 1865, when his evidence was to the effect that there was a doubt whether at Tewkesbury the effects of the sewage at Worcester had been destroyed. He had altered his opinion, because he had since made the question of river water as a source of supply one of especial study, and because the means of analysis were better. He could not now say that he was wrong in expressing a doubt then, when there was no evidence to the contrary. He admitted that good well water was better than river water, and that if both sources were available he should prefer the latter.

Mr. James Glaisher, F.R.S., and Superintendent of the Meteorological Observatory at Greenwich, said he had paid especial attention to the question of rainfall. He was able to form an accurate judgment as to the rainfall in the district in which Cheltenham was situated. He found that in the three driest years of which he had record—viz., 1857-9—the average rainfall at Gloucester was 22.2 inches, and at Witcombe 22.4 inches. But in the southern counties the evaporation and absorption were large, and amounted to as much as 16 inches; but taking them at 15 inches there would only remain 7½ inches available for storage. This could be gathered if the storage was sufficient, but he was told that the storage proposed by the Corporation was only 90 millions, and he thought this wholly insufficient. It sometimes happened that the total rainfall of the district was only one inch in a month, and to provide for these times of drought there should be a storage capacity of at least 250 days, and the storage capacity of the proposed reservoirs would only provide 400,000 gallons available for the supply of the town and the provision of compensation. The supply required for Cheltenham would be 1,250,000 gallons a day.

Cross-examined: He should not be surprised to hear that the rainfall at Thames Head was 28 inches. It was usual to deduct one-sixth to arrive at the approximate average of the driest years, and that would give little more than the average he had stated. He was examined in the Stockton case. He had not before given evidence with reference to the Cheltenham water supply.

Dr. W. Pole, C.E., F.R.S., said he had had much experience in matters of water supply, and acted as Secretary to, and drew the report of, the Duke of Richmond's Commission. He had visited Cheltenham, and considered the supply as inadequate. In connection with the Royal Commission he had examined the springs near to the head of the Thames. He should not have advised application for the Thames Head water for the use of Cheltenham, seeing it had been decided that the water from one watershed should not be diverted to another watershed. Cheltenham was thus driven back to the western slopes of the Cotswolds. Taking these springs as insufficient, there was no alternative but to take the water of the sand-bed, which was objectionable, or the Severn. There was no doubt as to the sufficiency of the supply the Company were allowed to take for all possible purposes. The Royal Commission decided that the Thames water was a good one for the supply of London, after the fullest inquiry as to its character. He had examined the water at Tewkesbury, and found it good and well filtered. After a knowledge of all the circumstances, he thought the Company had done right in going to the Severn.

Cross-examined: All river water should be filtered, and well filtered. He would not recommend the use of any without such filtration. The condition of water might be such that it could not be sufficiently filtered by mechanical means; but if subsidence was properly provided for, filtration became much easier, and it was generally held that filtration through sand was a chemical process as well as a mechanical one. The object of the Royal Commission on the supply to London was to decide between the continuance of a supply from the Thames, and the going to the head of the Severn. The Commission decided that the objections to the supply from Hampton were not sufficient to justify the abandonment of the present supply. If they had been considering the supply of London *de novo*, he still thought they would have preferred taking the water from Hampton to going to North Wales. Tewkesbury was below the level of Cheltenham, and the water would have to be raised by steam power. In addition to the lifting of the water, there would be the resistance of the friction, equal to about 10 feet per mile. Very considerable power would be required. The Royal Commission recommended that the water supply should be in the hands of the Local Authorities; but he did not think the reasons would be applicable in the present instance. There was no difficulty in the construction of subsidence works, but it would be advisable to construct reservoirs sufficient for a supply, independent of the condition of the Severn.

Mr. J. B. Foster, C.E., said he had been connected with the design and construction of many works in Lancashire, and had an extensive knowledge of the same. In February he, in company with Mr. M'Londsbrough visited the Shrewsbury, Worcester, and Gloucester works, and examined the Severn at the proposed point of intake. He had considered the question of an increased supply for Cheltenham. He had examined the deposited plans. He believed an increased supply was necessary. Seeing the present was only 24,000 gallons, which would only be at the rate

of 20 gallons per day for 14,000, there should be a large increase of supply. He had also examined the present supply, and found that the water was of good quality. He had inspected the source of the present supply. The water was beautiful in regard to taste. It was supplied from the lias at the top of the colite. Few springs issued from the lias. With the exception of those springs, there was no other subterranean supply, as far as he could see. They were fed by the rainfall of the district. The lower lands were on the lias formation, and the effect of a supply above these lands would deprive the immediate districts of supply. The nature of the ground in the vicinity of the Dowdeswell Valley was unsuitable for the construction of reservoirs; and a reservoir of sufficient size could not be constructed. He estimated the total yield the Company could get from these sources—the springs and rainfall supply combined—would be 364,000 gallons per diem, which, without allowance for compensation, would be a supply of 20 gallons to 18,200 persons; and deducting one-third for water compensation, the net amount would be 243,000, representing 20 gallons for 12,150 population. Having regard to these conclusions, he believed Mr. Hawksley was justified in going to the Severn, which, independent of the Sierford Springs, was the best supply for Cheltenham.

Cross-examined: In 1854 he was clerk to Mr. Taunton, and then proposed the formation of reservoirs on the same site as now scheduled by the Corporation; but they were of very different shape. He knew a case in which the lift of water was greater than proposed by the Company. It was the case of Wolverhampton. He was also pumping against much greater pressure himself in Lancashire, but it was a temporary expedient; though it was as easy to do a thing for three years as for three months.

By the CHAIRMAN: He did not know whether the Company made any arrangements for periodically examining the quality of the water supplied.

This being the last witness of the Company,

Mr. POPE said that he presumed the usual practice would be pursued where there were competing schemes, and as he should not be entitled to two speeches, he would now examine his witnesses.

Mr. Bradley, keeper of the Diglis Weir, below Worcester, was called. He had occupied his position since 1872. After a freshet the water was very thick and discoloured, and he had seen hundreds of dead animals in the stream. He had seen these in all states of the water, and in all stages of decomposition. In hot weather they smelt very offensively. The water became stagnant above the weir in summer time, and sometimes it ceased to flow over the weir. He had been compelled to stop two out of the three salmon passes to keep a head on the water. There was a deposit of black mud on the banks after a freshet, which smelt badly in summer. On an average there were about four tugs a day passing up and down the river. He had seen as many as 23 lighters following a tug, and the average was about 15 or 17. There was an average of four persons to each vessel. Some of the vessels carried unpleasant cargoes, such as gas tar, and fishermen complained of the effect of these upon the fish. He knew Tewkesbury. In the spring tides the tide would push open the lock gates, and he had seen vessels passing through upon the tide. On these occasions the tide brought up impurities as well as vessels. He had lived on the Severn all his life, but he had not drunk the water for 20 years, because he did not believe in it. The boatmen landed to supply themselves with pump water. If the townspeople saw the river as he saw it, he was sure they would not drink the water. In 1868 the water was below the weir for two months. In that year, in 1870, and in 1874, the water smelt badly.

Cross-examined by Mr. VENABLES: Though he objected to the Severn water, he had not had his water analyzed. His well was at the end of the house, about 45 or 50 feet from the Severn.

By the COMMITTEE: He had seen wood floating up on the tide some distance above Tewkesbury. It would not happen frequently that only one of the salmon passes was available. It was so for two months in 1868.

Mr. Williams, keeper of the Tewkesbury Weir for the last 13 years, said the river was very muddy at times, and sometimes there was as much as 7 inches deposit on the locks, and 2 feet in the cutting after one freshet. He had known not more than 1 inch of water floating over the weir for hours together. The water smelt very badly at times as it flowed over the weir, and also when the paddles were opened. The Avon water was worse than the Severn, he thought. There was a great quantity of dead bodies brought down in a freshet. The tide flowed up over the weir on five consecutive days last month.

By the COMMITTEE: Other animals besides those of cats and dogs, flow down the river; sometimes horses, donkeys, and sheep.

The Baron de Ferrières said: I have lived in Cheltenham for the past 17 years, and am now Mayor of the town. I live on Bayshill, the high part of Cheltenham, on the clay. I think I am well acquainted with the opinion of the people of Cheltenham. Cheltenham has no trade beyond the supply to the residents and visitors, and it is principally known in connection with education. Cheltenham College stands next to Eton, I believe, in the number of its scholars, and we have also a ladies college of a very high character. We held a meeting in December, in accordance with the Borough Funds Act, at which I presided, as Mayor, and the Corporation Bill was then submitted and discussed. It had been a topic of general comment before then, and I was surprised there was no opposition, the meeting being unanimous.

By the COMMITTEE: The meeting was large for its kind. There were about 200 persons present.

Mr. BIDDER: It is suggested near me that you have under-estimated it.

Witness: Perhaps so; I would rather do so than over-estimate it. I am convinced that there is a strong prejudice against the introduction of Severn water—whether well or ill founded. I believe it to generally prevail. The present supply is insufficient, but I believe the people would rather put up with it than have the Severn water. I believe the prejudice against it would operate injuriously to the town. It is a town that depends on its reputation, and once let it be thought that its water is unwholesome, and harm would be done.

If you were to print the evidence of Mr. Hawksley and Dr. Tidy, do you think it would convince the people it was safe to drink sewage?—I did not hear it, but a prejudice is not easily removed. There has been a scarcity of water for many years.

Seeing the number of years this has continued, do you think the Water Company have done their duty?—Well, they naturally look to their dividends—all Companies must do so—and they compel us to use insufficient appliances. They have raised my water-rate from 12 to 15 guineas.

By the CHAIRMAN: I am rated at £200 a year.

Examination continued: The Company raised the rates very generally on the clay, where the houses were dependent on them for a supply; and on the sand-bed where they could do so. It did not pay them to supply the poorer districts, and the Corporation would be far better able to meet the sanitary requirements of the town if the water supply was in their own hands.

Cross-examined: In May a deputation of the Corporation waited on the Company, and they were required to lay down mains in the Sherborne Street district. They did so; but the Corporation took no advantage of it, because they could not go beyond a certain rate of charge, which would not pay the Company.



Mr. VENABLES: Was it not the case that the Company were prepared to accept anything that the Corporation were prepared to pay?

Witness: I never understood it so.

What I suggest is that the Corporation, in order to exercise their compulsory powers against the Company, required the mains to be laid down, and then never had the water taken on by a single house?—The Corporation were prepared to do so, as I understood, but they could not meet the requirements of the Company. The supply was not available for closets, which is a very important matter. I believe the town is decidedly opposed to the Severn Water.

Mr. VENABLES admitted that the feeling of a majority of the ratepayers was against the Company's Bill.

Cross-examination continued: I know the *Cheltenham Examiner*. I have no doubt the report of the meeting in December, in that paper, is an accurate one. I do not remember that so much was said about the Severn water as about the need of a further supply; but it was understood at the meeting that the Corporation proposal was for spring water, and the Company for the Severn, and the affirmation of the one scheme was a strong condemnation of the other. That was expressed by the unanimous resolution passed. The real wish was to get possession of the water-works.

Mr. VENABLES: And did you ever know a body of men who were not prepared to vote for the getting of other people's property? Would they not vote unanimously for the possession of your estate?

Mr. BIDDER (to witness): But in this case they were quite prepared to pay a fair price?

Witness: Certainly.

Mr. BIDDER quoted, from the *Cheltenham Examiner's* report of the meeting, the speech of Dr. Brown, to show that the Severn water was expressly spoken of, and the witness said it was really thought unnecessary to discuss it, the town having already gone into it in 1865.

Mr. T. Stiff, captain of the tug-boat *Athlete*, plying between Gloucester and Stourport, said he made a daily journey between those places. He had taken as many as 23 vessels up at a time, and as few as three. Each vessel had about two men, and women and children. He had never seen water in the river as clear as that now on the table. There was a good deal of carrion in the river at times. He had never drunk the water of the river, but carried a cask for clean water. He had seen the tide above the weir at Worcester. It often banked the water up at the Mythe. He had not noticed that there were more dead cats and dogs lately since this Bill was introduced.

MONDAY, MARCH 11.

Mr. Isaac Webb, examined by Mr. BALFOUR-BROWNE, said he was captain of a steam-tug which runs between Gloucester and Stourport. He had been on the river eighteen or twenty years, and had been in the habit of towing a large number of boats up and down. The river was subject to freshets or floods. After one of these there was a settling on the banks, and it smelt very much in the summer season. It was a turbid stream, and in winter time was continually in flood. He believed the villages and towns on the banks poured their sewage into the river. He was not in the habit of drinking the Severn water, because of the smell, and sometimes there were a great number of dead animals floating about. He used water from the springs, and kept it in a cask on board his tug. The river was a great deal worse in summer-time than in winter. When a plank was put in, sewage matter was stirred up, and something of all sorts. He had seen the tide running over the weir. It ran at the top of the spring, a mile or two above the Company's intake.

Cross-examined by Mr. VENABLES: His tug could float past the intake of the Company at Tewkesbury. Sometimes the tide was two feet and a half over the weir. Where the plank stirred up the sewage was at the culvert where the sewage of Worcester came in. St. John's, on the west side, sent its sewage into the river. It was a suburb of Worcester. He had seen the river in a very foul state between Worcester and Stourport, which was 13 miles above Worcester. In the rainy season the water was like blood about two miles above Worcester. In winter the Teme was very red. Both between Stourport and Worcester, and Worcester and Tewkesbury, the water was very bad.

Re-examined by Mr. BALFOUR-BROWNE: The Worcester and Birmingham Canal ran into the river just above the Worcester Lock, which was below where the Worcester sewage came in.

Mr. John Pittersay, captain of the *Science* steam-tug, gave confirmatory evidence.

Mr. George Harris, collector of the Severn tolls, living at Llanthony Dock, South Gloucester, said he had worked with vessels on the Severn 53 years. For the last 30 years he had been a servant under the Severn Commissioners. At Upton, in summer time, the river was very bad indeed. Early in the morning there were very strong and offensive smells, and there were a lot of bubbles rising up in the water, and they seemed to burst and throw off an offensive smell. In the autumn floods the water was very thick and muddy, and brought a lot of dead animals down with it. He had seen those animals taken out by the watermen. They took the skins off when it was worth doing so, opened them, took out the fat and sold it; and if the meat was fit for animal food afterwards it was eaten, or if not, thrown back into the river. He had never drunk Severn water. His family had for generations been owners and masters of vessels, and it was a regular saying with them that they never used the Severn water if they could possibly get spring water, and they never had. He had tasted the water, but did not like it; it was very disagreeable, and left a dirty taste in the mouth afterwards. It would not keep if put into casks; but after two or three days, according to the weather, a lot of dirty scum rose to the bungalow and smelt offensively. He had tried to use it for cooking, but found a great deal more scum on the kettle before it commenced boiling than was obtained from spring water. About ten years ago he saw a vast quantity of dead salmon on shore about and below Gloucester. The thick water had killed them. The filth of Gloucester was brought up some seven or eight miles by the spring tides.

Cross-examined by Mr. VENABLES: It was not near the Gloucester Gas-Works that he saw the dead salmon. He did not think the weirs at Upton and Gloucester had made any difference in the condition of the river.

William Geemes, in the employ of Mr. South, landlord of the Lower Lode Inn, three-quarters of a mile below Tewkesbury, said he had worked the ferry at that place for 20 years. The spring tides came up past that spot and brought with them a considerable amount of mud and filth and all kinds of animals. They left an offensive deposit on the banks. The effect of the Tewkesbury Weir was to dam up the water above and to collect the filth, as it were, in a pound. He did not drink the Severn water, as it was not fit for drinking or cooking. The boats sometimes called to get drinking water as they objected to using the Severn water.

Cross-examined by Mr. VENABLES: He could not say whether much sewage came into the Severn by the upper branch of the Avon. There was not so much filth coming up the river as there was before the dam was erected at Gloucester. Some years back there had been dredging between Tewkesbury and Gloucester, but there had not been any since the weir was put up. He did not know whether the channel was filling up.

Mr. VENABLES: Your place is just by the second branch of the Avon, where it comes into the Severn?

Witness: Just by there.

Mr. VENABLES: Then I should think it was offensive water.

Re-examined: Although the weirs had been put in, they did not drink the Severn water.

(To be continued.)

## Legal Intelligence.

WIGAN BOROUGH POLICE COURT.—THURSDAY, APRIL 11.

(Before Mr. BOOCROFT, Chairman, and Mr. THOMPSON.)

TEMPLETON v. THE CORPORATION OF WIGAN.

CONVICTION UNDER THE GAS-WORKS CLAUSES ACT, 1871.

In this case the plaintiff, Mr. R. C. Templeton, dentist, 20, Marsden Place, Wigan, sued the Corporation of Wigan to recover penalties for neglecting to publish the accounts of the gas-works, of which they are the owners. The summons was in the following terms:—"That you, the said Mayor, Alderman, and Burgesses, who by the Council are the Corporation of the said borough, and as such Corporation are the undertakers for supplying the said borough with gas, did make default in complying with the provisions of section 35 of the Gas-Works Clauses Act, 1871, by not selling to the said Robert Clark Templeton, upon application duly made by him at the office of you, the said undertakers, a statement of your accounts as such undertakers, made up to the 31st day of December, 1874, a statement of such accounts up to the 31st day of December, 1875, and a statement of such accounts up to the 31st day of December, 1876, respectively, he, the said Robert Clark Templeton, having tendered to you the legal amount of one shilling for such copy; and that from the said 23rd day of December last past, up to and including the 27th day of March instant, have continued and still continue to make such default, contrary to the statute in such case made and provided."

Mr. W. LEES appeared to support the summons, and the Corporation were represented by the Town Clerk (Mr. Maskell W. Peace).

On the case being called,

The Town Clerk said he wished to point out to the Bench that the summons was wrong, inasmuch as it charged them with three distinct offences in one summons. Only one could be proceeded with under that summons, and it would be for the complainant to elect which one he would proceed upon.

Mr. LEES: If the Town Clerk will point out the three separate offences, I will answer him, and, if need be, elect which one I will proceed upon.

The Town Clerk: That we made default in complying with the statute by not selling to the complainant, upon application duly made by him at the office of the undertakers, a statement of accounts as such undertakers, made up to the 31st day of December, 1874, is one offence. Then with respect to the accounts made up to Dec. 31, 1875 and 1876, respectively.

Mr. LEES said he would refuse to consent to any amendment. The summons was carefully considered before it was submitted for signature to the signing Magistrate. He should therefore proceed to call his witnesses.

The Town Clerk said he must ask for the Magistrates decision on that point. It was distinctly laid down that one offence only could be charged in a summons.

Mr. LEES said the summons taken out was that they refused to comply with the 35th section of the Gas-Works Clauses Act of 1871. That section said, "The undertakers shall keep copies of such annual statement at their office, and sell the same to any applicant at a price not exceeding one shilling for each such copy." Now, before a sale could take place there must be a demand made, and in this case it would be proved in evidence that a demand had been made. If the complainant had gone to demand a copy of the accounts for 1874, and, the day after, the accounts for the year ending Dec. 31, 1875, and the day after that, for the accounts for the year ending Dec. 31, 1876, his friend's contention would have been right, but here it was one joint demand.

The Chairman said the Bench were advised that there were three separate offences charged in the summons, and it would now be for the complainant to elect upon which he would proceed.

Mr. ELLIS (Magistrates Clerk) said that, were it thought proper, the complainant could afterwards proceed upon the other offences. It had to be borne in mind that the amendment of the summons was for the complainant's benefit, and not for the Corporation's.

Mr. LEES said he would elect to proceed against the Corporation for the 31st of December, 1875.

The Town Clerk proposed to state another objection, but it was decided to hear the plaintiff's case in the first instance.

Mr. LEES said this was a summons taken out against the Corporation as the owners of the gas-works, and the question to be decided by the Bench was simply one of fact, and rested on a plain reading of an Act of Parliament, called the Gas-Works Clauses Act, 1871, which was specially incorporated in the Wigan Improvement Act, 1874. The Wigan Corporation were enabled under the Act of 1874 to purchase the gas-works, which they did, for the sum of £135,228 2s. 6d. The purchase was to be completed, and they were to get possession, under an express provision of the Act, from the 1st of July, 1874. The Act gave the Corporation enormous powers, inasmuch as it gave them the sole right of supplying Wigan and the outlying districts, with two or three exceptions, with gas. By the Gas-Works Clauses Act, 1871, incorporated in their special Act, the Corporation were placed under an obligation to which the old Gas Company were not subject—viz., to render annual accounts. That obligation, however, they had not complied with, and consequently express negligence lay upon the shoulders of the defendants, for the offence with which they were charged. The 35th section of the Gas-Works Clauses Act, 1871, said, "The undertakers shall fill up and forward to the Local Authority of every district within the limits of the Special Act, on or before the 25th day of March in each year, an annual statement of accounts, made up to the 31st day of December then next preceding, as near as may be in the form, and containing the particulars specified in Schedule B to this Act annexed." It was also provided that "The undertakers shall keep copies of such annual statement at their office, and sell the same to any applicant at a price not exceeding one shilling for each such copy." The section then went on to say: "The Board of Trade, with the consent of the undertakers, may alter the said forms for the purpose of adapting them to the circumstances of the undertaking, or of better carrying into effect the objects of this section. In case the undertakers make default in complying with the provisions of this section, they shall be liable to a penalty not exceeding forty shillings for each day during which such default continues." On the 20th of December last, Mr. Templeton proceeded to the office of the undertakers, and there demanded from a Clerk of the undertakers the accounts referred to in the statute, and tendered payment of a shilling for such accounts, and he was told there were no such accounts in existence, and that consequently he could not have them.

Mr. THOMPSON: He asked for the accounts for 1875.

Mr. LEES: And they were not forthcoming. After that he wrote to the Clerk of the Peace for the County, and he failed to obtain them there. A second demand was made on the 28th of December last, and a third



demand on the 28th of March of the present year; and on the last occasion the Clerk again told Mr. Templeton that the accounts were not there, and that they did not have them to sell. The complainant then applied to other offices of the undertakers, the Town Clerk's, the Borough Treasurer's, and all the other offices, and failed to obtain them, and he (Mr. Lees) did not think he was going too far in saying they were not yet out, and that it was impossible at the present moment to obtain them. Those were the simple facts of the case, and he would have left the matter there had it not been that the Gas Committee, being responsible for this state of things, had issued a kind of defence, and that showed him how he should shape his case. He would have no reply to his friend, so that he would allude to what the defendants would bring before the Bench. This was a summary proceeding for penalty against a Local Authority for not complying with their own Act of Parliament, and it was made summary with the view, no doubt, of saving expense. Had not this been in the Act, a person aggrieved would have been compelled to go to the Court of Chancery. The Legislature showed the importance they attached to the compliance with the 35th section of the Act of 1871 by fixing the penalty of 40s. a day for every day during which the default continued. It was, therefore, not a thing to be laughed at, but a matter of a serious nature affecting the expenditure of £200,000. The Corporation were bound to know the terms and requirements of their own Act of Parliament, and there was no excuse to urge on their behalf for the neglect of which they had been guilty. With regard to the amount of penalty to be imposed, he might remark that this action had not been brought in any vindictive spirit, although it might do for certain members of the Gas Committee to suggest that it had been so. Mr. Templeton throughout had acted courteously. He asked courteously for the accounts which he was entitled to, and he was told he could not get them. He asked in the proper quarter, and he could not get them, and he had not got them yet. That was not the spirit of a man who wanted to snatch a verdict for the omission. He wished for the accounts not only in his own interest but in the interest of the ratepayers, so that he might see how the money had been expended. The Auditor himself had recently published a report in which he said he could not defend the old form in which the accounts had been furnished. That was substantially an admission of the complainant's case.

The TOWN CLERK said he would now state his objection. In considering the Gas-Works Clauses Act, it must be looked at in connection with the Wigan Improvement Act, 1874. By the 5th section the Act was to be carried into execution by the Corporation acting by the Council, and according to the Municipal Corporations Act, and, after missing a few lines, "as nearly as may be in all respects as if the powers, duties, and property vested in, imposed on, or employed by the Corporation by or under this Act were vested in, imposed on, or enjoyed by or under the Municipal Corporations Act." The same Act further on—section 66—authorized the Gas Company to sell and the Corporation to purchase the gas-works, and as a matter of fact the gas-works had been so purchased. Therefore it was quite clear that the gas-works were vested in the Corporation, and by sec. 5 they were to be managed by them under the Municipal Corporations Act. He would now proceed to consider how far the regulations of the Gas-Works Clauses Act applied to the Wigan Corporation. If the Magistrates would turn first to the Gas-Works Clauses Act, 1847, they would find that that Act was not in the usual form; it was divided into various parts, and those parts were introduced by certain introductory words, forming, so to speak, headings to each, and the reason for putting it into that shape was expressly declared. By sec. 5, it stated that it should be enough to describe the clauses of the Act with respect to any matter in the words introductory to the enactment with respect to such matter, and it also stated that these were divided in order that certain clauses, not only these various headings, might be incorporated or not incorporated by the mere mention of the introductory words to which the clause subsequent to them related. There was a series of regulations contained in that Act which related to the keeping of the accounts. Following the 29th section, were the words "and with respect to the amount of profit to be received by the undertakers when the gas-works are carried on for their benefit, be it enacted as follows." There was a series of clauses incorporated under that heading. These were the sections 30 to 39 inclusive, and then came another series of sections, and in those sections there was nothing whatever relating to the mode of keeping accounts, and therefore the object of the Act in requiring the accounts referred to in the Act of 1847 to be filed with the Clerk of the Peace for the county had in view concerns where the amount of profit to be received from the gas-works was for the benefit of the undertakers. He would leave that Act of Parliament for a moment and go to the Gas-Works Clauses Act of 1871, which was the Act under which the Corporation were summoned. That Act began by expressly stating that, "whereas, it is expedient that the provisions contained in the Gas-Works Clauses Act, 1847, should be amended; be it therefore enacted" . . . "that the Gas-Works Clauses Act, 1847, and this Act shall be construed together as one Act, and the provisions of this Act shall be held to repeal and supersede such of the provisions of that Act, as are inconsistent with this Act." Therefore, in order to understand the true legal bearing of the case, the Act of 1847 and the Act of 1871 were to be considered as one Act. He had pointed out what in the Act of 1847 were the regulations with respect to the accounts, and he had shown under what headings they were to be incorporated. In the Act of 1871 there was no clause relating to the accounts, but when the two Acts were considered together they must read the Act of 1847 as if the 35th section of the Act of 1871 had been incorporated under the heading to which he had previously called attention. What could be more reasonable than that contention? The Act of 1847 had established a series of regulations for the keeping of accounts, in order that where the undertakers for their own benefit supplied the public with gas, the latter should have sufficient means of knowing how the works were carried on, and in order to show that the provision not to take more than a certain profit was duly observed and carried out. That was the tree planted by the Act of 1847, and upon that tree the 35th section of the Act of 1871 engrafted another branch, and that was that the accounts should be filed with the Clerk of the Peace, and that they should be kept and furnished to every applicant. If the Magistrates would look at the forms scheduled at the end of the Act of 1871, it would be perfectly clear that the contention he now maintained was correct. It was apparent on the face of every one of the sheets which were contained in a rather extensive schedule to the Act, that they were intended for a Company or for undertakers who carried on works for their own benefit. In that schedule the forms of account were given under various headings—"Capital account," in which the several classes of shares were set out; also "Debenture stock," "Mortgages and bonds," and "Amount received in anticipation of calls." Then came "Revenue account," containing "Management expenses," "Directors allowances," &c., and then there was a "Profit and loss account." What, therefore, could be more clear than that the whole thing was intended to apply to a Company carrying on business for their own benefit? He hoped he had established this point to the satisfaction of the Bench. But what did the Wigan Improvement Act of 1874 say? It said that the property was to be acquired by the Corporation, and it said it was invested in them under the Municipal Corporations Act; and they knew there must be a certain form of account

which must be kept by the Municipal Corporation as a Municipal Corporation, as far as the expenditure of the district-fund account was concerned. Those were entirely different to the Act referred to. If the Magistrates would turn to the Wigan Improvement Act, 1874, they would find it was expressly provided by section 78 that, from and after the gas transfer, all the powers and authorities of the Gas Company under the Wigan Gas Act, 1861, should be, by virtue of the Act, transferred to and vested in the Corporation, subject, nevertheless, and according to the following exceptions and provisions:—Sub-section 3: "The provisions of the Gas-Works Clauses Act, 1847, incorporated with the Wigan Gas Act, 1861, shall not apply to the Corporation as far as regards the provisions with respect to the amount of profit to be received by the undertakers when the gas-works are carried on for their benefit." Therefore, it was clear that that section did not apply to the Corporation, for the 3rd sub-section of section 78 expressly exempted them. But there was more than that. He should have been content to have stopped there; but when the Bill was before Parliament, Lord Redesdale was not satisfied that they should be left there. There was another Act which he would bring under the notice of the Bench. The Wigan Improvement Act pointed out to what account the proceeds of the gas-works should be carried. It said that all the receipts of the Corporation from the sale of gas, and all other receipts under this account, should be carried to, and form part of, the district fund account. It was perfectly clear, first of all, by the Act negating the clauses contained in the Gas-Works Clauses Act, as far as regarded this point, that they were not bound by them; and, secondly, that they were bound by the declaration at the beginning of the Wigan Improvement Act, that the property was vested in the Corporation as a Municipal Authority; and next, by the expressions at the end of the Act, telling them they were to carry their receipts to the borough fund account. The provisions of the Act of Parliament relating to the municipal and the district fund accounts, were not only different in form, but they were expressly different as to dates. Supposing for a moment, by the Gas-Works Clauses Act, they had to file the accounts to the 31st of December, they would be inconsistent as regarded dates, for in the Act under which they prepared their accounts they had to present accounts made up to the 31st of August. Therefore the dates were quite different. Having stated these facts, he might remark that this was not a case in which no accounts had been furnished. The accounts required by the Wigan Improvement Act had been duly kept, and had been furnished to Mr. Templeton. As to the Act of 1847 and the Act of 1871 being construed together, that had been expressly adopted by Mr. Templeton in this case, as the Magistrates would see by turning to the letters written by him. Mr. Templeton did construe them together, and in one of his letters said that he (the Town Clerk) was no lawyer; but he would say Mr. Templeton was a good lawyer so far as that went, but that he did not know the whole law. He did not know that the Wigan Improvement Act expressly abrogated and did away with the Act of 1847. Had Mr. Templeton known that, he would not have written to the Clerk of the Peace, and these proceedings would never have been commenced. He submitted that where an informer was going for penalties, the Magistrates must be satisfied beyond all doubt that his contention was correct before they gave a conviction, and he submitted it was clear that the 35th section of the Act of 1871 was to be read by the Act of 1847, which it repealed.

MR. LEES said he admitted that the Gas-Works Clauses Act of 1847 no more applied to the Wigan Gas-Works than the man in the moon. The old Gas Company were exempted from furnishing accounts, and the Corporation would not have been bound to furnish accounts had it not been for the special sub-section of the Act of 1874.

MR. ELLIS: You say that the Gas-Works Clauses Act of 1847 does not apply to the old Gas Company?

MR. LEES: Yes. The old Company were not forced to furnish accounts, for the Act was passed after the establishment of the Company.

MR. ELLIS: You do not make a point of it?

MR. LEES said he did not make a point of that. The only matters material were those referred to in sub-section 3 of section 38 and section 95 of the Act of 1874. The former said that the "provisions of the Gas-Works Clauses Act, 1847, incorporated with the Wigan Gas Act, 1861, shall not apply to the Corporation, as far as the provisions with respect to the amount of profit to be received by the undertakers when the gas-works are carried on for their benefit." There was a great difference between an account and an amount. An account showed the amount made; the amount, as they all knew, showed the actual cost. His friend referred to the 95th section of the Wigan Improvement Act, to show that his contention did not apply. The section was as follows:—"All receipts of the Corporation from the disposal or utilization of sewage and from the sale of gas, and all other their receipts under this Act, shall be carried to and form part of their district-fund account." Certainly it said the receipts were to be carried to the district-fund account, but the Corporation did not for one moment say that the accounts published since Mr. Templeton made his application for the gas-works accounts, and which could be got for 1877, were not according to the form in which they were asked for by the complainant. The 79th section of the Wigan Improvement Act, 1874, expressly stated that "the Gas-Works Clauses Act, 1871, shall apply to the undertaking of the Gas Company, when vested in the Corporation, as if that undertaking was authorized by this Act," according and subject to certain provisions, and that over-rode the Act of 1847, and incorporated the Act of 1871, which imposed upon them the obligations mentioned in the 35th section. It was therefore clear that, inasmuch as the 35th section had not been repealed, and was in force, nothing else could. The Act of 1871 imposed penalties with regard to pressure, and also with regard to other things, and the 79th section regulated and toned down the section to what it was intended. The 95th section, which had been quoted by his friend, showed that his (Mr. Lee's) contention was beyond all question of doubt, as it showed the receipts were to be carried to the borough-fund account.

MR. R. C. Templeton, examined by Mr. LEES, said he was a dentist, and lived at 20, Marsden Square, and had resided at Wigan for some time. He was on the 20th of December last a consumer of gas from the gas-works belonging to the Corporation, and he was also a ratepayer in the borough. On that day he went to the gas office of the Corporation. He saw Mr. Bolton, one of the clerks, and asked him for a statutory abstract of the accounts for the year ending Dec. 31, 1875, and received the reply that there were no such accounts. He tendered a shilling for a copy of the accounts, and explained that what he wanted were the accounts under the Gas-Works Clauses Act, 1871. Mr. Bolton said he had never seen such accounts, and that he (complainant) consequently could not get them. He wrote to the Town Clerk on the 28th of December, offering to pay the amount prescribed, on or before receipt, for a copy of the accounts. There was some correspondence between them, but he did not get the accounts. He went to the office of the undertakers on the 27th of last month. He saw Mr. Bolton, asked him for the same accounts, and tendered a shilling in payment, but was told there were no such accounts. He then went to the Borough Treasurer's, asked for the accounts, tendered his money, and was told there were no such accounts in existence. He got some accounts from the Town Clerk.



The TOWN CLERK said the complainant got the accounts for which the summons was taken out.

Mr. ELLIS (to Mr. Lees): Are you putting it as a continuing offence?

Mr. LEES said it was a continuing offence, but he did not want to make it a continuing offence.

Examination continued: He subsequently wrote a letter to the Town Clerk on the 17th of January, 1878. The accounts received from the Town Clerk were produced. He had compared them with the form in the schedule, and they were certainly not "as near as may be" in the prescribed form. The accounts produced for the half year ending the 31st of December, 1876, were nearly in accordance with the Act, but there was one account missed out. The accounts ought by the Act to be annual accounts, but those before him were only for the half year. He produced the Town Clerk's letter of the 14th of January, offering to meet him at his office, to put him in possession of such information as he (the Town Clerk) had been able to obtain in the matter, which was in reply to a letter of his (complainant's) seventeen days previously. On the 15th of January he wrote saying he should endeavour to wait on the Town Clerk at his office, though he failed to see the necessity of such an engagement; and again on the 17th, stating that he should be unable to call upon him as arranged. The result of that letter-writing was not to get him the accounts.

Cross-examined by the TOWN CLERK: The accounts received by him were not in accordance with the Gas-Works Clauses Act, 1871. He could not tell whether they were in accordance with the Municipal Corporations Act. He knew the Gas-Works Clauses Act, 1871, pretty well, and he knew the forms contained in the schedule to that Act. The form Schedule B began with "Form of Annual Accounts, the — Gas Company." He expected the Wigan Corporation were to keep accounts in the form contained in that schedule. He expected the Corporation would keep a capital account—not share capital, but loan capital. They had to raise money for gas-works purposes on the mortgage of the rates of the borough, and therefore there must be loans. He required a statement of loan capital. The accounts sent him contained that statement, but only for the half year ending December, 1876. He got the Borough Treasurer's account from July, 1874, to the 30th of June, 1875. It contained a trade account between those dates, and it contained a profit and loss account, though he would rather call it part of the trade account, although the trade account was separate from it. It was not in the way prescribed by the Act of 1871.

The TOWN CLERK said the complaint was that the accounts did not contain the information required by the Act. The Corporation were bound to keep them in the way they had done, and he was prepared to show with respect to the loan capital that they contained the particulars mentioned in the Act.

The CHAIRMAN (to witness): What information is it you want that you do not find in these accounts?

Witness: I cannot see the position of the Corporation, as to whether the statement of the large profits which are said to have been made are correct, from the accounts of the Borough Treasurer, and that is the information I want; but, if they were given to me in the statutory form prescribed by the Act I should find all the information I require.

The TOWN CLERK: What we say is that the accounts are the accounts required by the Municipal Corporations Act, and contain all the particulars. (To plaintiff:) You say you want more information than the accounts furnish. Did I offer, if you would come and meet the Chairman of the Gas Committee and myself, that we would give you any information that we possessed? Did you get that offer?

Witness: I did. I would have come to meet you on that occasion, but I heard afterwards that I was also to meet the Mayor and the Auditor. Probably I might have received information if I had gone—probably not. The information I have obtained partly helped me to prepare the pamphlet I have published. I am not compelled to say where I obtained it. I went into these accounts before I could get the information I applied for in the statutory form, but I do not think that has anything to do with the sale of a copy of the accounts. I simply applied for the accounts. My pamphlet has nothing to do with it.

Mr. ELLIS: The Magistrates wish to ascertain whether your objection is to the form of the accounts, or whether the accounts given you by the Corporation do not substantially give you the information you ask, and which they are bound to give.

Witness: The object of my wishing to get these accounts is to know exactly what profit the gas department is making. The Corporation are carrying on the works for the benefit of the ratepayers.

In re-examination, he said that he had not yet obtained the gas accounts for the year ending Dec. 31, 1875. The accounts furnished him were not in accordance with the statute, and they did not supply the information wanted.

This was the case for the prosecution.

The TOWN CLERK said he should not occupy the attention of the Magistrates long, as it was not necessary. Reference had been made to admissions in the Auditor's report, but that had nothing to do with the case now before the Court. It was natural for the Gas Committee to do what they could to elucidate the matter, but that did not affect the question. They were now present to answer the charges of a common informer, who asked the Magistrates to inflict a penalty upon the Corporation. He maintained they had treated the complainant with the greatest possible courtesy. They had given him the accounts as kept by all Municipal Authorities, and they had offered to meet him so as to give him any information that might be required; but the complainant would not meet them, but went and published a violent attack upon the accounts kept by the gas-works department, and then came and asked the Bench to impose a fine upon the Corporation. He (the Town Clerk) submitted the Bench could not fine the Corporation, because the section relied on was inapplicable to the Corporation of Wigan; and he submitted, further, that the Corporation had done their duty as a Municipal Authority. He would call Mr. Caldwell, the Borough Auditor, who would prove that the accounts had been published and filed according to law.

Mr. John Caldwell, examined by the TOWN CLERK, said he was the Auditor of the borough of Wigan, and had been so since and before the Corporation had acquired the gas-works in 1874. He had since then audited the yearly accounts. He could not say whether those accounts were in the form required by the Municipal Corporations Act; but he had examined them, and compared them with the books of the gas-works, and they were correct. They contained the whole of the accounts of the Corporation as far as they were connected with the gas supply, from the acquiring the gas-works to the present time, and they contained substantially the information which was required by the 35th section of the Gas-Works Clauses Act, 1871, except so far as might be necessary to ascertain the profits of a trade concern.

Cross-examined by Mr. LEES: My attention has been drawn to the Gas-Works Clauses Act, 1871. I cannot say that I have since found the accounts ought to have been prepared in accordance with that Act. I have prepared a report and presented it to the Council. [A copy of the printed report by the Auditor was produced.] At the same time I do not care to defend the old forms. The one as provided by the Act is unquestionably superior as a question of account. I refer to the form in

which they are now produced, which is the form pointed out by the schedule to the Act of 1871. If my attention had been called to the Gas-Works Clauses Act, 1871, when I first audited the accounts in 1875, I might possibly have called the attention of the Corporation to the omission, and told them they must prepare their accounts in that form. Whether it is so required by law I cannot tell. I have audited them now in that form.

Mr. LEES: Have you had much difficulty in getting them as near as practicable to the form in the Act?

Witness: The accounts in the old form require remodelling to bring them to the present form. The books require remodelling to bring them to the way pointed out by the Act, so as to correspond with this schedule.

Cross-examination continued: I cannot say they are now as near as near may be, but I say they answer the purpose. I said in my report, "It was obviously necessary, in order to comply strictly with this provision, that an intermediate abstract should be made of six months only, and thence annually to the 31st of December." My powers as an Auditor are limited to seeing that the accounts are correct. In 1875, I did not know what the provisions of the Act of 1871 were. I was instructed by the Committee in February last to go into these accounts. In going through them, my attention was called to Mr. Templeton's pamphlet. I did not report that there were certain inaccuracies that any one might make.

Mr. LEES: What about the £2822 under the reserve-fund?

Witness: That did not affect the ultimate result.

I am not talking about the ultimate result. To what extent were the accounts incomplete?—For 1875.

Well, you had audited them as correct?—And they are correct.

When did you audit the accounts for 1875?—I cannot say exactly; but, no doubt, soon after they were made up. I cannot tell how long it took me to do it.

Cross-examination continued: The receipts from the gas-works are handed over to the Treasurer of the Corporation, who stands in relation to them as their banker with regard to the gas accounts.

Mr. LEES: The receipts are not carried to the borough-fund account.

Witness: No, they are not.

Mr. ELLIS: What do you understand by receipts?

Witness: The earnings of the gas-works.

Mr. LEES: The £10,000 profit—was that carried to the borough-fund account?

Witness: No; that was carried to the next year's account.

Mr. W. Holt, the Borough Treasurer, examined by the TOWN CLERK, said the accounts since 1874 had been published in accordance with the Municipal Corporations Act and the Acts relating to the Corporation of the town as an Urban Sanitary Authority.

Cross-examined by Mr. LEES: I did not prepare the gas accounts. I have nothing to do with them. I only pay their bills. The accounts are prepared at the gas-works. I keep the accounts separately, as required by the Act. Mr. Caldwell is the Auditor on behalf of the Corporation, and is paid a separate amount for auditing their accounts as a Corporation. There are two gentlemen who assist him, and are paid a guinea each per day. Mr. Caldwell is paid a separate sum for auditing the gas accounts.

The Magistrates then retired, and on their return into Court, The CHAIRMAN said the Bench were of opinion the Corporation had not complied with the 35th section of the Gas-Works Clauses Act, 1871, and they thought it was a day for the three days when copies of the accounts were asked for would meet the requirements of the case. The Bench extremely regretted the case could not have been settled out of Court.

## Miscellaneous News.

### METROPOLIS GAS SUPPLY.

Dr. Whitmore's report on the illuminating power, pressure, and quality of the coal gas consumed in the parish of Marylebone, and supplied by The Gaslight and Coke Company, during March:—

	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quantity of Sulphur in 100 Cu. Ft.	Mean Quantity of Ammonia in 100 Cu. Ft.	Sulphuretted Hydrogen.
	Mean of 24 Observ.	High-est.	Low-est.	High-est.	Low-est.	Grains.	Grains.	
Gas supplied from the Fulham works . . . .	16.61	17.00	16.31	19.46	9.93	18.66	0.46	No trace
Gas supplied from the Beekton and Bow works . . . . .	16.70	17.10	16.11	37.07	19.07	13.16	0.25	No trace
Cannel gas supplied from the Pimlico works . . . . .	20.50	21.20	20.01	21.16	11.81	12.46	0.46	No trace

Mean of daily readings of barometer . . . . . 29.86  
 " " " " thermometer . . . . . 59.56

\* Each observation consists of ten readings of the photometer, at intervals of one minute.

The mean illuminating power of all the three gases consumed in the parish during the month was something more than half a candle above the legal standard, and on no occasion was it found in either of them to be below the standard. On five occasions the gas supplied from Beekton and Bow gave a light exceeding 17 candles; twice the light of the cannel gas exceeded 21 candles. The mean amount of sulphur found in 100 cubic feet of the Fulham gas was 18.66 grains, in the Beekton and Bow gas it was 13.16 grains, and in the cannel gas 11.81 grains. The quantity of ammonia in all was less than half a grain. The pressure was generally satisfactory, and on no occasion was sulphuretted hydrogen detected in either of the gases by the ordinary tests.

### METROPOLIS WATER SUPPLY.

THE METROPOLITAN BOARD WATER SUPPLIES.—At the meeting of the Metropolitan Board of Works on Wednesday, the 17th inst.—Mr. Roche in the chair—the Parliamentary Committee presented the following report:—"Your Committee have had under consideration the question of the course to be adopted with the two Bills of the Board relating to the water supply of the Metropolis, and it appears to them, looking at the position of the two Bills, that it would be well for the Board to refer the question to the Works and General Purposes Committee for consideration and report, and to instruct the Solicitor to report to that Committee upon it. Your Committee recommend accordingly." On the motion for the adoption of the report, Mr. Runtz moved, as an amendment, an instruction to the Committee to withdraw both Bills at once, remarking that they were evidently in a hopeless condition; in which opinion Mr. Watkins, who seconded the amendment, fully concurred. The member for St. Luke's, however, talked of bringing "pressure to bear upon the Government," if some help was not given to the Board in the way of facilitating their schemes; whereupon Mr. Fowler advised the speaker to try the effect



of "the pressure" of his eloquence on his own vestry. After some further conversation, the motion was agreed to, on a division, by a majority of seven.

The Registrar-General publishes the following returns of the average daily quantity of water supplied by the London Water Companies during the month of March. According to these, 120,026,106 gallons, or 545,334 cubic metres of water (equal to about as many *tuns* by measure, *tuns* by weight) were supplied daily; or 221 gallons (100·4 decalitres), rather less than a *ton* by weight, to each house, and 31·2 gallons (14·2 decalitres) to each person, against 29·5 gallons during March, 1877.

COMPANIES.	Number of Houses, &c., supplied in		Aver. Daily Supply of Water in Gallons* during	
	Mar., 1877.	Mar., 1878.	Mar., 1877.	Mar., 1878.
Total supply . . . . .	531,114	541,894	111,349,135	120,026,106
From Thames . . . . .	248,645	255,659	56,524,124	60,589,557
„ Lea and other Sources . . . . .	282,469	286,235	54,825,011	59,436,549
THAMES.				
Chelsea . . . . .	28,737	28,859	7,189,360	7,340,600
West Middlesex . . . . .	48,962	50,422	9,503,913	9,393,895
Southwark and Vauxhall . . . . .	77,880	80,159	17,200,000	18,550,000
Grand Junction . . . . .	37,055	37,910	10,569,811	11,396,662
Lambeth . . . . .	56,011	58,369	12,061,100	13,408,400
LEA AND OTHER SOURCES.				
New River . . . . .	125,070	126,300	24,564,000	26,214,000
East London . . . . .	111,967	115,143	23,712,500	25,986,000
Kent . . . . .	45,432	44,792	6,548,511	7,236,549

\* Including that for manufactures and for various purposes other than for domestic consumption.  
 Note.—The return for March, 1878, as compared with that for the corresponding month of 1877, shows an increase of 10,780 houses, and of 8,676,971 gallons of water supplied daily.

Dr. Frankland reports as the result of his analyses of the waters supplied to the Metropolis and some of its suburbs during March, that, taking the average amount of organic impurity in a given volume of the Kent Company's water during the nine years ending Dec., 1876, to represent unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Tottenham 0·9, Kent 1·1, Colne Valley 1·2, New River 2·1, East London 3·2, West Middlesex 3·5, Chelsea 3·7, Grand Junction 3·9, Lambeth 4·2, and Southwark 4·4. The water drawn from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was more impure in March than in February. That distributed by the Southwark Company was slightly turbid, it contained fungoid growths, and dyed fibres probably derived from the washing of rags in paper mills. For the first time in the ten years during which these observations have been made the water sent out by the West Middlesex Water Company was slightly turbid. The suspended matter in this Company's water contained moving organisms. The water of the Lea was of better quality, and was efficiently filtered before delivery. The water supplied by the Kent and Colne Valley Companies, and by the Tottenham Local Board, was bright, wholesome, palatable, and of most excellent quality for dietetic purposes. The Colne Valley Company's water was also soft and suitable for washing. Seen through a stratum 2 feet deep, the water supplied by the Kent and Colne Valley Companies, and by the Tottenham Local Board, was clear and colourless; the New River and East London Company's water was clear and almost colourless; the Chelsea Company's water was clear and very pale yellow; that of the West Middlesex Company slightly turbid and very pale yellow; that delivered by the Grand Junction and Lambeth Companies, clear and pale yellow; and that by the Southwark Company slightly turbid and pale yellow.

Results of Analysis expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Mat- ters.	Or- ganic Car- bon.	Or- ganic Nitro- gen.	Ammo- nia.	Nitrogen, as Ni- trates and Nitrites.	Total combined Nitro- gen.	Chlo- rine.	Total Hard- ness.
Inner Circle.								
Thames—								
Chelsea . . . . .	30·36	·133	·039	0	·247	·286	1·6	21·8
West Middlesex . . . . .	29·40	·151	·055	0	·232	·287	1·55	20·3
Southwark and Vauxhall . . . . .	30·98	·222	·041	0	·212	·253	1·6	21·3
Grand Junction . . . . .	30·16	·191	·011	0	·224	·265	1·6	20·9
Lambeth . . . . .	21·16	·200	·051	0	·259	·310	1·65	21·2
Other Sources—								
New River . . . . .	20·34	·098	·028	0	·365	·333	1·55	21·5
East London . . . . .	33·06	·164	·028	0	·280	·308	1·9	22·4
Kent . . . . .	40·12	·050	·014	0	·509	·523	2·5	26·9
Outer Circle.								
Colne Valley . . . . .	12·38	·059	·010	0	·335	·345	1·4	5·3
Tottenham Local Board . . . . .	47·56	·040	·016	0	·543	·559	3·5	26·1
Corporation of Birming- ham* . . . . .	31·36	·118	·029	·001	·209	·238	1·4	18·8
Corporation of Glasgow† . . . . .	2·90	·132	·023	0	·006	·029	0·55	1·27

\* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.  
 † Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.  
 Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

Dr. Whitmore's report on the composition of Thames Companies and other waters supplied to Marylebone during March:—

	In Grains, per Gallon.		In Parts, per Million.		In Degrees.	
	Total Solid Matter.	Loss by Incine- ration.*	Chlo- rine.	Free Ammo- nia.	Albu- minoid Ammo- nia.	Hard- ness. ing Fifteen Minutes.
West Middlesex . . . . .	20·70	0·80	1·04	0·01	0·08	14·4
Grand Junction . . . . .	21·60	0·90	1·16	0·02	0·07	14·8

\* The loss by incineration represents the amount of organic and other volatile matters contained in the Imperial gallon (70,000 grains) of water. The total solid matter, minus such loss, consisted chiefly of carbonate of lime, with small quantities of other equally harmless salts.

The water of both Companies, as seen through a glass tube two feet long, was clear and well filtered. The water taken from the Thames at Hampton was slightly turbid. No living or dead organisms were detected by the microscope.

RIO DE JANEIRO GAS COMPANY, LIMITED.

The Thirtieth Annual General Meeting of the above Company was held at Cannon Street Hotel, London, on Friday, April 5—Mr. BARTLETT JAMES, in the absence, through illness, of Mr. Macgregor, occupying the chair.

Mr. T. Dawson (the Secretary) having read the notice calling the meet- ing, and the minutes of the general meeting held on the 6th of April, 1877, the following report was taken as read:—

The Directors, in accordance with the Articles of Association, paid on the 5th of October last an interim dividend of £37,500, free of income-tax, being at the rate of 10 per cent. per annum on the present paid-up capital of the Company; and now have the pleasure of submitting to the Shareholders the annexed statement of accounts for the year ending Dec. 31, 1877, and showing a balance at the credit of the profit and loss account of £125,272 0s. 3d., reduced by the above-mentioned interim dividend to £87,772 0s. 3d.

Out of this sum of £87,772 0s. 3d. the Directors recommend that a dividend at the rate of 10 per cent. per annum, also free of income-tax, be paid for the half year ending the 31st of December last; this will reduce the available balance to £50,272 0s. 3d., which the Directors have disposed of as follows, viz.:—They have placed £6000 to the reserve-fund, and £12,000 to the insurance and contingency fund, and have carried forward to the next account the remainder, say £32,272 0s. 3d., out of which income-tax for the past year has been paid.

The reserve-fund for the equalization of dividends now stands at £10,000, and the insurance and contingency fund at £78,006 18s.; of this amount, however, there remained still to expend £11,767 1s. 1d., which has been already distributed amongst the Share- holders in the last issue of bonus shares, leaving £66,239 16s. 11d. available for pro- spective expenditure. The whole of this sum, and much more, will be required for the new gasholder and extensions previously referred to, and for the further expenditure incidental to the new contract which the Company are in hopes of obtaining from the Brazilian Government, whom, with the sanction of the last general meeting, they have again approached for that purpose, and who will certainly require very considerable extensions and increase of plant for the supply of the constantly increasing demand for gas in the city and suburbs of Rio de Janeiro, and to meet which satisfactorily the old mains will have to be, in many places, substituted by other pipes of larger dimensions, and in others probably duplicated.

Up to the 31st of December last there had been expended on gasholder No. 3 and new mains £138,232 18s. 11d., as stated in the balance-sheet, and £975 1s. 10d. since then.

Mr. Bartlett James is the retiring Director in accordance with the Articles of Associa- tion, and, being eligible, offers himself for re-election.

The Auditor, Mr. Harding (of the firm of Harding, Winney and Co.), also retires, and offers himself for re-election.

The Directors, in handing this statement of last year's operations, which no doubt will be considered very satisfactory by their fellow-shareholders, must again remind them that the Company have been singularly favoured by the continued low prices of coals, and the especially low rates of freights.

Mr. Bartlett James, who is shortly about to revisit Rio de Janeiro, will, during his stay there, have much pleasure in co-operating with the Chairman, H. E. Viscount de Mauá, in everything relating to the affairs of the Company.

Mr. Joseph Hancox having accepted a business engagement which will compel him to reside in Rio de Janeiro for a few years, tendered his resignation as a Director, which was accepted by the Board.

Dr.—Balance-Sheet, for the Year ending Dec. 31, 1877.

To Capital, 37,500 shares of £20 each, fully paid up . . . . .	£750,000	0	0
Sundry creditors at Rio and London . . . . .	1,248	16	9
Dividend warrants still unclaimed . . . . .	1,123	0	0
Bills payable . . . . .	5,188	4	0
Reserve-fund, balance brought forward from Dec. 31, 1876 . . . . .	4,000	0	0
Amount carried to this fund this year . . . . .	6,000	0	0
Insurance and contingency fund . . . . .			
Balance brought forward from Dec. 31, 1876 . . . . .	£36,006	18	0
Amount carried to this fund this year . . . . .	42,000	0	0
	£78,006	18	0
Less amount already capitalized by decree of Brazilian Government, but not yet expended . . . . .	11,767	1	1
Amount available for further extensions and expenditure . . . . .	£66,239	16	11
Profit and loss—			
Balance of profit brought forward from Dec. 31, 1876 . . . . .	£2,097	1	3
Less income-tax for 1876 . . . . .	1,072	19	3
Net profits for the present year . . . . .	£1,021	2	0
	124,247	18	3
	£125,272	0	3
Deduct carried to insurance and contingency fund . . . . .	£42,000	0	0
Deduct carried to reserve-fund . . . . .	6,000	0	0
	48,000	0	0
	77,272	0	3
	£922,838	19	0

Cr.—Balance-Sheet.

By Sundry assets, viz.—			
Gas-works, houses, land, 128 miles of mains, asphalt works, poles and carts, lighters, &c. . . . .	£582,705	14	8
New gasholder, No. 3, additional mains, &c. . . . .	138,232	18	11
Coals . . . . .	15,842	4	0
Gas-fittings . . . . .	3,218	13	6
Sundry debtors, being gas consumers at Rio . . . . .	65,336	6	11
Cash at Rio . . . . .	3,075	1	11
Cash in London . . . . .	16,430	2	4
Bills receivable, in hand . . . . .	50,063	7	7
Shipments afloat . . . . .	10,434	9	2
Interim dividend of the 5th of October last paid to Shareholders at the rate of 10 per cent. per annum, on £750,000 . . . . .	37,500	0	0
	£922,838	19	0

The CHAIRMAN said that he had very few words to add to the report. Having referred to, and expressed regret at the absence of the Vice-Chair- man, Mr. Macgregor, he continued: The operations of the Company during last year have resulted in a profit larger than was ever before obtained; but we must beg again to call your attention to the fact that we were singularly favoured by the continued low price of coal, and more espe- cially by the extraordinarily low rate of freights. You will see by the balance-sheet, and by the report itself, what we have done with the excess of profits over the dividend, and I think that we have expressed ourselves very plainly, telling you that all this sum will be required, and very prob- ably more. Our contract will expire on the 25th of March next year, and we must be prepared for, no doubt, a great many fresh additions to the area of lighting now existing; and, in fact, in any case it is but wise to be prepared for whatever may occur. As authorized by the general meeting of last year, we have approached the Brazilian Government, and we were in treaty with the late Government up to the end of last year. On that occasion there was a change not only of Ministers, but of politics in the empire, and a Liberal Government have now come in. They found the finances of the country in rather a tight corner, but they have done their best to relieve them, and we have now approached the new Government, and I hope before very long we may have good news to announce to the Shareholders. I do not know that I need refer to anything else in the report, except to state that I hope soon to visit Rio de Janeiro, and I shall be most happy to do anything that lies in my power to further the obtaining of a reasonable concession from the Brazilian Govern- ment, which, individually, I have no doubt about, for they have always acted with extreme fairness during the long period that we have been



with them, for 24 years; and I do not know any instance in which they have not treated all parties quite fairly. I shall be most happy to answer any question which you would like to put to us, and I now propose—"That the report of the Directors for the year ending the 31st of December, 1877, be received, adopted, and confirmed."

Mr. LEWIS HOWARD (the Managing Director) seconded the motion.

In reply to a Shareholder, who asked in what position the negotiations with the Brazilian Government were at the present time,

The CHAIRMAN said that, by their last accounts, the papers were in the hands of the respected Minister of Agriculture, and he promised the Company's representative to take them into consideration as early as he could. But the Shareholders must remember that the new Government only came into power at the beginning of this year, and their latest advices were from the beginning of March. The Minister had, therefore, had very little time to "warm his seat," for there was a vast amount of work to do for any Minister coming fresh into the Brazilian Government, and he believed everywhere else; but the Minister had promised to give them his attention as soon as he could.

The report was unanimously adopted, and

The CHAIRMAN then proposed—"That a dividend at the rate of 10 per cent. per annum, free of income-tax, be declared for the year ending Dec. 31, 1877."

Mr. JOHN HENRY JAMES seconded the motion, which was carried unanimously.

Mr. HOWARD moved, and Mr. SINCLAIR seconded, the re-election of Mr. Bartlett James, the latter observing that they all knew the valuable services Mr. James had rendered to the Company.

This motion was agreed to.

Mr. JAMES thanked the Shareholders for having re-elected him, and said he had been connected with the Company since his youth, or since their youth certainly.

Mr. HOWARD proposed, and Mr. WORDSWORTH seconded, the re-election of Mr. Harding as Auditor for the ensuing year, at a remuneration of £21, and the motion was carried unanimously.

Mr. SINCLAIR moved, and Mr. NATHAN seconded, a vote of thanks to the Chairman for his conduct in the chair, and to the Directors for their services.

The CHAIRMAN having briefly returned thanks, the proceedings terminated.

#### BRISTOL WATER-WORKS COMPANY.

The Annual General Meeting was held on Saturday, the 30th ult.—Mr. F. Fry in the chair.

The SECRETARY (Mr. A. J. Alexander) read the Directors report as follows:—

The revenue from water-rates for the year 1877 was £57,815 2s. 4d., being an increase of £1042 9s. 11d. over that of the previous year, notwithstanding the reduction of the trade consumption arising from the closing of the Counterslip Sugar Refinery, but for which the increase of water-rates for the year would have exceeded the average of recent years.

The sum shown, by the revenue account annexed to be applicable for dividend is £16,627 19s. 7d., and the Directors recommend that a dividend of 5 per cent. on the ordinary £25 and £20 (£12 paid) shares be now declared. This, with the intermediate dividend of 5 per cent., will make the dividend for the year 10 per cent., and leave a balance of £2231 13s. 7d., out of which the Directors recommend payment of 5s. per share to the Proprietors of the ordinary £25 shares, which with 2s. 6d. per share paid on the 12th of October, will make 7s. 6d. per share paid for 1877 on account of arrears of dividend, and leave £231 13s. 7d. to be carried forward.

Considerable progress has been made with all the extension works referred to in the last report. At Chelvey the sinking of the pumping well has been completed. The new engines for the Chelvey and Clifton pumping stations are in a forward state; at the latter station the new buildings have been commenced.

The Board regret to report the death of their late esteemed colleague, Mr. John Wetherman, who during 21 years took an active interest in the management of the affairs of the Company.

The vacancy thus occasioned at the Board has been filled by the election of Mr. William Henry Wills, whose experience in the conduct of public business will be of value to the Proprietors.

In the last report it was stated that the Town Council had resolved that it would be for the interest of the city to purchase your works. Negotiations, commenced by a Committee of the Council, and to which your Directors devoted much anxious consideration, were continued until the 13th of October. In the course of these negotiations a complete scheme for the transfer of the undertaking was prepared, but on the 7th of December the subject came before the Council, and was allowed to drop without discussion. The Board, though they saw no cause for desiring to part with your property, would have been willing to recommend your acceptance of fair and reasonable terms.

The Proprietors were informed by circular on the 12th of May that the Bristol District Water Bill had been successfully opposed by the Company. The Committee of the House of Commons having heard the evidence on both sides, after a short deliberation unanimously decided to reject the Bill.

The Board, believing it to be desirable to exercise the powers of the general Act of Parliament relating to Public Companies, with regard to the conversion of loans into capital will, at an extraordinary general meeting to be held on the same day as the ordinary meeting, submit to the Shareholders a resolution to authorize the creation of £84,000 ordinary share capital, to be divided into 8000 shares of £6 each and 8000 shares of £4 10s. each, and to be offered to the holders of the ordinary £25 and £20 shares. Such £6 and £4 10s. shares to receive a fixed dividend after the rate of 5 per cent. per annum up to Dec. 31, 1883, and after that date to be entitled to ordinary dividend.

An agreement has been entered into with the Bristol Port and Channel Dock Company for a supply of water to be taken for the purposes of the Avonmouth Dock. The necessary main from the Durdham Down reservoir to the dock will be laid forthwith.

The capital expended during the past year was £49,749 8s. 7d., and the length of mains laid about 15½ miles.

The Engineer, Mr. H. W. Pearson, reports that the works are in good condition.

The retiring Directors are Mr. Fry and Mr. Abbot, who are eligible, and offer themselves for re-election.

The retiring Auditor is Mr. Grace, who offers himself for re-election.

#### Dr.—Capital Account to Dec. 31, 1877.

To Debenture stock	£59,495 0 0
Mortgages and bonds under original Act	2,800 0 0
Preference stock	100,000 0 0
Debenture stock, 1874	35,325 0 0
Mortgages and bonds under Act of 1853	20,900 0 0
Mortgages under Act of 1862	6,100 0 0
Preference shares, Act of 1862	80,000 0 0
Mortgages under Act of 1865	5,400 0 0
Preference shares, Act of 1865	80,000 0 0
Original shares	200,000 0 0
£20 ordinary (1872) shares	95,996 0 0
Balance	28,569 13 4
	<b>£714,585 13 4</b>

#### Cr.—Capital Account.

By Expended, as per last account.	
In the year ending Dec. 31, 1877—	
Parliamentary and professional charges	£5,250 9 8
Construction of works	37,849 7 10
Mains and service-pipes	6,649 11 0
	<b>49,749 8 7</b>
	<b>£714,585 13 4</b>
Balance brought down	<b>£28,569 13 4</b>

#### Dr.—Revenue Account.

Dec. 31, 1876—	
To Balance of revenue account	£18,897 9 6
Less dividend of 5 per cent., paid April 17, 1877	£12,651 16 8
Less paid April 17, 1877, on account of arrears of dividend on original shares	3,000 0 0
Less transferred to reserve-fund	2,000 0 0
	<b>17,651 16 8</b>

Dec. 31, 1877—	
Water-rates	£1,245 12 10
Rents	57,815 2 4
Transfer fees	365 16 8
	<b>£59,444 11 10</b>

Balance brought down	£31,200 5 2
Balance	<b>£16,627 19 7</b>

#### Cr.—Revenue Account.

Dec. 31, 1877—	
By Office and engineering expenses—	
Salaries	£1,746 10 0
Printing and advertising	175 9 2
Incidentals and sundries	476 0 0
	<b>£2,397 19 2</b>

Collectors commission	1,429 11 0
Pumping at Chelvey	478 6 0
Expenses of working Victoria engine, and maintaining Victoria, Durdham Down, Bedminster Down, Leigh, and Knowle reservoirs	1,090 11 3
Wages to men in charge of reservoirs and works in the country, repairs and maintenance	409 10 7
Wages to Turncocks	941 8 2
Rates and taxes	4,178 9 8
Repairs	354 5 9
Directors remuneration	800 0 0
Auditors fees	42 0 0
Interest on debenture stock	3,792 16 0
Ditto on loans	129 9 1
Ditto on preference stock to June	2,500 0 0
Ditto on preference shares, 1862	3,600 0 0
Ditto ditto, 1865	3,600 0 0
Retained to pay half year's interest on preference stock to December	2,500 0 0
Balance	<b>31,200 5 2</b>

	<b>£59,444 11 10</b>
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Intermediate dividend paid Oct. 12, 1877	£13,572 5 7
Paid Oct. 12, 1877, on account of arrears of dividend on original shares	1,000 0 0
Balance carried down	<b>16,627 19 7</b>
	<b>£31,200 5 2</b>

#### Dr.—General Balance-Sheet.

To Balance, revenue account	£16,627 19 7
Balance of reserve-fund	2,708 17 6
Sundry accounts due from the Company	21,904 9 9
	<b>£41,241 6 10</b>

#### Cr.—General Balance-Sheet.

By Balance of capital account	£28,569 13 4
Arrears of water-rates	6,220 4 9
Sundry accounts due to the Company	1,186 4 11
Stock on hand	3,711 11 9
Cash in Banker's hands	1,540 1 11
Ditto Secretary's hands	13 10 2
	<b>£41,241 6 10</b>

The CHAIRMAN, in moving the adoption of the report, said: Gentlemen, We have much pleasure in meeting you again, to render an account of the result of another year's working of your undertaking, which, I think, cannot fail to be very satisfactory. You will see, by the statement of the accounts, that the water-rates have increased only £1042. This is accounted for by the falling off in the requirements for trade purposes, as explained in the report. It is therefore very gratifying that the additional revenue laid on has more than met this deficiency. The cost of pumping and other charges show a considerable decrease. We cannot omit to allude to the loss which we have sustained since our last meeting, in the decease of Mr. John Wetherman, who was a valued colleague, taking as he did great interest in your affairs. Your Directors have paid much attention to the extension of the works during the past year, to meet the constantly increasing demand for the supply afforded from the Company's mains. The well at Chelvey is sunk to its depth. The boilers and other parts of the two engines, of 120-horse power each, have been delivered, and the pumps and other machinery will be fixed as soon as circumstances permit. The large volume of water which has been encountered, whilst highly satisfactory as to quantity, has caused much time to be occupied in the execution of the works. Your Consulting Engineer, Mr. John Taylor, is fully satisfied with the result. We have been requested by the Board of the Avonmouth Dock Company to take a supply to their property, whereupon an arrangement has been made for an annual payment by the Dock Company. The pipes are ordered, some of which have been delivered and will be laid forthwith. Many of the inhabitants on the line of the main have often expressed a desire that we should afford them a supply of water. It is generally known that the negotiation for the sale of your works to the Corporation concluded as alluded to in the report. I believe both parties are well satisfied—the Corporation that they have avoided purchasing a concern they did not appear fully to appreciate, and the Directors that they have not sold your works, which you may well be content to own, increasing in value as they have hitherto done. Mr. William H. Wills, the High Sheriff of this city, has been elected to a seat at the Board. No commendation can be needed from me, as he is so well known and esteemed a fellow-citizen. I may say that I have sat at the same board-table with Mr. Wills for many years with much pleasure. I will now call attention to a few facts, which must be taken into consideration, bearing on the propriety of the extension of the share capital, without prophesying for the future, as from our experience we can confidently look to the past as our guide. Now that we are recommending you to create £84,000 share capital, we may look back to the mode in which the existing capital has been raised. The Act incorporating the Company was passed in 1846; the water from the Barrow Spring was brought into Bristol in October, 1849. The first dividend, 14s. per cent., was paid for the year 1855; and 4 per cent. per annum was not arrived at until the year 1866, 20 years after the Act had been obtained. When the income of the Company was small, and the capital expended was necessarily large, the Board decided that the best policy for the interest of the Shareholders was to raise a large portion of the capital by permanent loans, at a fixed low rate of interest, so that when a profit should be earned on the loans it would increase the dividend earned on the small amount of ordinary share capital, which, until lately, was only £200,000.



It appears to us now our duty to you to recommend an extension of the share capital, by exercising the power given to you by Parliament, to complete the creation of £800,000 capital. Your Directors think it best that all sums called up on these shares should receive only 5 per cent. per annum interest for six years, and that after that period these shares shall be entitled to dividend with the other ordinary shares. You will observe that the object which will be gained by fixing the interest at 5 per cent. for the next six years is, that these shares shall not interfere with the dividend payable on the existing shares. The capital, as it will be paid up from time to time, can be no charge on the revenue for the six years, more than any difference between loans at 4 per cent. and 5 per cent. payable on these shares. Part of the deposit will be applied immediately to pay off loans. When the existing £20 shares were created, we informed you that we believed that they would be no burden on the old shares, but that the capital so raised would earn its own good dividend, and, so far, it has proved to be the case, and, indeed, improved the old shares. We may, therefore, again look to our past experience, as the same circumstances still exist and are likely to continue. With this addition the share capital will be but a small part of the whole sum compared with the proportion allowed by Parliament—two-thirds share capital and one-third loans. At the present time, 33 years after the establishment of the Company, the ordinary share capital is only about half the capital paid up. The share capital will be only £44,000 more than half of the capital, when the authorized capital, £800,000, is called up, including this new creation. Our ordinary share capital, now paid up, is only £296,000 and we might have had shares paid up to the extent of £476,000, and the dividend would now be less than 7 per cent. per annum; and the right to back interest which would have arisen to make up the dividends to 10 per cent. would have been a very much larger sum than it now is, and would be still increasing. With this explanation I believe the Shareholders will approve the recommendation now made to them, and adopt the resolution which will be proposed. The deposit which we propose to call is £2 on the £6 shares, and £1 10s. on the £4 10s. shares, payable on the 1st of May. The rental from new premises laid on this year is so far fully equal to that of last year. Should any persons say that the honourable Proprietors are receiving large profits, you may tell them that the dividends which have been paid on the original shares average only £4 0s. 9d. per cent. from the commencement. I can assure you most fully of our undiminished confidence in the substantial importance and the enduring nature of this concern. The importance of your works to the public is now generally admitted, and the weight of the responsibility of the position which your Directors hold is felt by them, and I unhesitatingly state that they endeavour, in all respects, to administer the powers entrusted to them, and to perform the duties required of them, faithfully and impartially, for the benefit of the public.

Mr. C. J. THOMAS seconded the motion, and said he thought, considering that they had lost—had the misfortune to lose—their largest customer, the Counterslip Sugar Refinery, it must be very gratifying to all the Shareholders to know that the revenue had kept up so well, and that it continued to go on in the same ratio.

The motion having been adopted, a dividend of 5 per cent. on the £25 and £20 (£12 paid) ordinary shares, for the half year to the 31st of December, was declared; also a dividend of 5s. per share on the £25 ordinary shares, towards making up the deficiency of previous dividends, the whole to be paid on the 16th of April.

The retiring Directors and Auditor were re-elected.

The meeting was then made special, and on the motion of the CHAIRMAN, after some conversation, it was resolved—"That all resolutions of the Company as to borrowing on mortgage or bond, or as to debenture stock, so far as the same remain in force, be and the same are hereby rescinded, and that new shares be created to the amount of the borrowing powers of the Company in manner following—that is to say, that 8000 ordinary shares of £6 each, and 8000 ordinary shares of £4 10s. each, be and the same are hereby created, such ordinary shares to receive a dividend in respect of the amounts paid up thereon respectively, after the rate of 5 per cent. per annum, and no more, up to and including Dec. 31, 1883, and from and after that day to be entitled to ordinary dividend in respect of the amount paid up thereon respectively, concurrently and equally with the existing ordinary £25 and £20 shares, and that the said ordinary £6 shares be offered to the holders of the said £25 shares, and that the said ordinary £4 10s. shares be offered to the holders of the said ordinary £20 shares, in proportion to the shares this day standing on the registers in the names of such holders respectively, and that instalments on such new shares be paid by the Shareholders who shall accept the same as follows—that is to say, £2 in respect of every £6 share, and £1 10s. in respect of every £4 10s. share."

The proceedings closed with a cordial vote of thanks to the Chairman and Directors.

## LIGHTING BY ELECTRICITY.

[Translated from *Le Gaz*.]

We hear it said every day that lighting by electricity is making progress, because the electric light has been fitted up in the Place de l'Opéra, at the Hôtel du Louvre, at the office of the *Figaro*, and at the Belle Jardinière. In our opinion that is not progress, but simply an expedient, like that resorted to 20 years ago, when the clothing establishment on the Boulevard St. Martin was lighted by means of the electric lamps then in use.

The apparatus of the present day are undoubtedly improvements on those of that period. The Jablochhoff "candle" is certainly a happy combination that suppresses the regulator; the electric machines of the Alliance Company, and those of Gramme and Lontin, are undeniably preferable to Bunsen's electric batteries. But if the apparatus have been improved, have the effects produced been also improved?

We remember that in 1857 or 1858 the galleries of the Conservatoire des Arts et Métiers were thrown open the whole of one evening to visitors, who had been invited by General Morin. On that occasion the lighting was effected by the electric light, with Serrin regulators; the excess of luminosity being absorbed by opaque glasses. The grand inner staircase was splendidly illuminated by two luminous focuses; and although the *soirée* lasted till nearly midnight, the light never for a single moment failed. There was the same brilliancy, the same intensity that we have to-day; and, moreover, there were the same hopes, the same promises, the same aspirations, the same certainty of success. Twenty years have passed since then—twenty years which have demonstrated the practical inefficaciousness of the system upon which so many hopes were based for the future.

It is true that during those twenty years active minds have sought to overcome this weakness, and that their researches have resulted in the construction of more perfect generators; machines have replaced the pile—the candle is substituted for the regulator. This is undoubtedly real progress; but the effect produced remains the same. There is still a too powerful light, which is offensive to the eyes, and requires to be considerably modified after it has been produced. In this respect no advance whatever has been made, for we are still unable to produce a light of less illuminating power than that given by 50 gas-jets.

People talk of the divisibility of the light; but what has actually been

arrived at is simply the multiplication of the luminous focuses upon a single current. That is far from having attained what is, strictly speaking, divisibility, which consists in reducing the light furnished by a luminous centre to its very lowest proportions. In this respect we are still as powerless as we were in the past; and, besides, can this multiplication of focuses upon a single current really be effected? It is certainly open to doubt, when we observe what takes place in each lantern in the Place de l'Opéra. In each group of five lanterns, there is, in fact, only one, and that the highest, which is lighted by electricity. Well, for this single electric focus twelve wires have been employed. Twelve wires for a single light, when people boast of supplying twelve focuses from a single current! That is a contradiction which is strikingly palpable.

However, we find that the progress that has been made is attended by the same phenomena we witnessed years ago. The new system is employed to attract the attention of the crowd, and, as the crowd applauds the results obtained, it is thought that the process is ripe for serious work; then people get excited, and the bases of a great *Compagnie Parisienne d'Eclairage par l'Electricité* are very quickly laid down, and the eternal Shareholder is called upon to subscribe the capital necessary for the enterprise.

But then something very curious occurs. The promoters of the Jablochhoff "candle" made trial of several electrical machines, in order to ascertain which one appeared to them to be the most efficacious, the safest, and the most economical. They naturally tried some experiments with the Shepard machine, which is the property of the Alliance Company, and as for a time they thought they had found some advantages in the employment of that machine, they said so, and their words were repeated and even printed. What their motive was for not persevering in the use of that machine we do not know; but they lost no time in returning to their opinion, or to their error, we are not quite certain which. However, this temporary preference opened to the view of the Alliance Company an unlooked-for era of prosperity. The history of this Company is well known. Originally established for extracting hydrogen gas from water by means of electricity, with the aid of a Clarke-Nollet-Shepard machine, the Company, notwithstanding several successful trials made in the presence of the Emperor, were never able to extract, for commercial purposes, a single cubic metre of gas from the raw material they had intended to use. But as their object was to work the water-gas industry, they obtained concessions for lighting Sens and Toulouse—with coal gas! These concessions were soon got rid of, and the Company applied their Shepard machine to the production of the electric light. It was said that they were engaged to light some lighthouse; but in this they could not have been successful, as their shares had for a long time been unsought for. However, the experiments made with the Shepard machine had again raised their hopes, and the public were very soon invited to subscribe for 6000 shares of 500 francs each in the *Compagnie Parisienne d'Eclairage par l'Electricité*, constituted by Acts of Jan. 22 and 31, 1878.

The object of this new Company was, according to the prospectus, "the construction of machines and apparatus intended for the production of the electric light, and fitting up the same in manufactories, dockyards, commercial and industrial establishments, railway termini, harbours, vessels, lighthouses, public open places, parks, encampments, &c.; lighting by electricity, and all applications of electricity to the sciences, arts, and industry."

As a guarantee for the shares taken up, the Company offered—

"1. The sole right to the stock-in-trade, patents, and processes of the old Alliance Company, whose apparatus, by means of which the division of the light is obtained, has been the object of several awards in the principal French and foreign exhibitions, and has recently been employed by MM. Denayrouse and Jablochhoff for lighting the Magasins du Louvre, the Belle Jardinière, the *facades* of the Opera House and the *Figaro* office, the building works of the Hôtel Continental, and other commercial establishments. These apparatus, to which the Company have the exclusive right, are indispensable in all cases where a fixed and constant light is required, and they alone are employed in the electric lighthouses that have been established in France and Russia, in the Adriatic, at the entrance to the Suez Canal, and at other important points.

"2. The Company's works, situated in the Rue Dufresnoy, Passy, with all the materials, tools, and manufacturing processes."

The advantages of the electric light over gas are then enumerated, and the prospectus continues:—

"The welcome accorded by the public to the experiments which have demonstrated the incontestable superiority of this new process of lighting, and its general applicability, assure to the Company profits that will attain proportions unknown to any of our great commercial enterprises."

Finally, the hope of dividends is thus established:—

"A working plant of 400 machines, distributing a light equal in intensity and power to that of 88,000 gas-jets—the lowest result, when compared with that which present needs and increasing demands lead us to foresee—will suffice to assure, according to certain calculations that have been made, a dividend of not less than 20 per cent. upon the shares. Each share gives a right to a proportion of the profits, to the extent of 80 per cent.; the remaining 20 per cent. being disposed of at the rate of 15 per cent. to the Board of Direction and 5 per cent. to the reserve-fund."

The Shareholders were to pay 75 francs per share on application, and the balance of 425 francs 30 days after the notice of allotment.

So much for the public. With regard to the Alliance Company, out of the entire capital of 5,010,000 francs (£200,400), they took as their share, according to the statutes, 5,000,000 francs (£200,000), leaving the new Company with 10,000 francs (£400) only for working capital. It is true that the subscribed capital could be augmented by general meeting.

The Alliance Company's share of the capital represented—

	Francs.	Sterling.
Property belonging to the Company situated at Passy, comprising offices, storehouses, and workshops, valued, free of all liabilities, at . . . . .	68,000	£2720
Materials, tools, instruments, machines made and in course of construction . . . . .	74,890	2995
Amounts owing to the Company, and vouchers of all kinds in their possession, including cash in hand . . . .	1,257,110	50,285
Designs, manufacturing processes, patents, &c. . . . .	3,600,000	144,000
Total . . . . .	5,000,000	£200,000

There would only remain, therefore, for the new Company, the sum of 10,000 francs in cash, the value of 20 paid-up shares, the price for which would have to be paid in full at the time of application. Now, if there were only 20 shares to be subscribed for, why invite the public to take 6000, unless it was to assist the Alliance Company in realizing the greater part of their share of the capital? However, this matter does not come within our province.

On reading the prospectus inviting subscriptions for shares in the new Company, the attention of M. Jablochhoff was aroused, and he caused a



summons to be issued against M. Vidal, the director of the *Moniteur des Fonds Publics*, to compel him to insert in his paper the following reply to his previous articles:—

M. le Rédacteur.—In your numbers of the 24th and 31st of January last, you inform the public that a Company is in course of formation for the purpose of working some new processes for the application of the electric light, and you announce, in advance, that you reserve your co-operation till the approaching issue of shares, which is shortly to take place.

I should abstain from all reflection both on the conditions under which this Company was formed and on the success you promise it in advance, if the enunciations mixed up with your opinion did not seriously affect the real facts, and at the same time my own personal interests.

Among the matters indicated by you as being about to engage the Company's attention you specially describe the electric candle, which I invented and have patented. Now, it is quite evident that as my assignees and I are the exclusive proprietors of this candle, no one else has the right to announce his intention of working it.

But this is not all. You advance the opinion that with regard to the machines intended to produce the electric current, they are the property of the Parisian Company in course of formation, and that no other machines can possibly compete with them. This is a second error. I am not mistaken; I know personally that the Alliance Company, who have now been transformed into the new Company, have made and can still make machines producing an electric current.

But what is likewise true is that several other machines are in existence, over which the Company have no control whatever, and I may add, without any necessity for explaining my motives in doing so, that after having myself utilized the Alliance machines, in applying them to the requirements of my patented invention, I have for some time past given the preference to others. (Signed) JABLOCHKOFF.

The extra-judicial document added that the insertion demanded was of extreme urgency on account of the effect that would be produced upon the public by the notices and reiterated publications which had appeared concerning the formation of the new Company, and it required the insertion of the preceding letter, without alteration, in a prominent position in the next number of the paper. This document was dated Feb. 9.

The next day MM. Jablochkoff and Denayrouse published the following circular:—

Sir,—You have, of course, received a prospectus, which has been very widely circulated, of a Company entitled the *Compagnie Parisienne d'Eclairage Electrique*, soliciting your aid in the subscribing of its shares. This is no other than an old Company called the Alliance, for the transformation of which circumstances appeared favourable.

We should not have to occupy ourselves either with the Company or their doings, if they had not caused our names to figure in a prospectus containing statements calculated to cause confusion, and supported by the rashest assertions.

In fact, the public will, on the one hand, be easily led to infer from it that the Company asking for their capital have a right to work "the apparatus recently employed by MM. Denayrouse and Jablochkoff for lighting the large Magasins du Louvre, the Belle Jardinière, the façades of the Opera House and the *Figaro* office, the building works at the Hôtel Continental, and other industrial establishments." On the other hand, even supposing that the doubtful wording of the prospectus on this first point is susceptible of a less absolute interpretation, it is undeniably clear when it affirms that the machines of the Company "are indispensable to every application of electricity where a fixed and constant light is required."

Now, we cannot allow such an equivocation or such a statement as this to be propagated under the apparent cloak of our names. We, therefore, boldly declare—

1. That we, and those with whom we have associated ourselves, are the sole registered proprietors of the lighting processes that have already been applied in the places specified in the prospectus in question, and hence it follows that the *Compagnie Parisienne d'Eclairage Electrique* have no right whatever to work them.

2. That the machines represented by the Company as being *indispensable* to us are so little so, that, after we had ourselves personally used them, we abandoned them, in order to adopt others more simple, more powerful, and four times less costly.

We have nothing to add at present to these declarations, and you, sir, will understand the spirit of fairness—to speak of that only—which dictates them to us. We could not, by our silence, accept a share of the moral responsibility of the undertaking for which your co-operation is solicited. We need not here qualify the means employed by the Company, but we shall point them out to all whom it may concern, and we consider it our duty also to point them out to the public, in order that our names may not be mixed up with the possible consequences of this undertaking, as, by a strange abuse, they have been mixed up with the statements we have noticed above.

(Signed) L. DENAYROUSE.  
P. JABLOCHKOFF.

Notwithstanding this circular, the public subscription still continued to be announced to take place on the 22nd and 23rd of February; but a few days before the 22nd a notice was posted up one morning at the bank from which the shares were to be issued, announcing that the subscription was deferred till the 8th and 9th of March, and in the afternoon of the same day, according to the papers, the intervention of the Commissary of Police caused the projected subscription to be adjourned indefinitely.

Why? That is the question of the day in the matter of lighting by electricity. How will it be solved?

#### LIGHTING AND HEATING AGENTS.

On Thursday evening, March 21, a Lecture on this subject was delivered in the Plymouth Institution by Dr. Robert Oxland, F.C.S. The lecturer commenced by tracing the history of the progress of improvement in lighting and heating arrangements from the days of the old rush and dip lights, through the various forms of candle, and the different kinds of oils and gases, on to the introduction and development of the use of coal gas, noticing, *inter alia*, the progress marked by the substitution of the modern lucifer for the ancient tinder-box. The uses of coal gas naturally claimed particular attention; and the lecturer made special reference to the acquisition of gas-works by corporations. The capital of the Birmingham Corporation Gas-Works, he said, was £2,250,000, serving 500 miles of mains with 2644 million feet of gas, the quality of which was 17·29 candles, or 24 candles better than the parliamentary standard. The total amount of the receipts was £453,727 last year, of which £128,145 was net revenue—a profit of 5·69 per cent. Thus in two years the works had earned £55,000, which had been devoted to the reduction of the local taxation. These results had, however, been very largely exceeded in the experience of the Manchester Corporation, who had of late years been the means of keeping in the front the very important question whether it was not the duty of all municipal corporations to take into their hands the supplies of water and gas. In 1807 there was only one gaslight at Manchester, and that was over the police office. In 1817 the Police Commissioners erected gas-works, and supplied gas at 14s. per 1000 feet. Since then extension of the works had kept pace with the times, and with such results that the Gas Committee of the Corporation, up to 1876, had transferred the sum of £1,060,075 to the Improvement Committee, which sum, therefore, instead of passing into the pockets of private shareholders, had been devoted to the commercial interests of the whole population. Why, he asked, should not the same thing be done at Plymouth? There was already sufficient evidence of administrative ability on the part of the Municipal Authorities in the present state of the water supply, although there were some who thought that in this there might be considerable improvements. Such a project would doubtless meet with an amount of opposition from the Shareholders, but their proper interests might be equitably adjusted consistently with the taking in hand by the Corporation of the supply of gas, so that the benefit of the future enlargement of the town might thus be equitably divided amongst those who might contribute to its welfare. It was quite true that there were many *pros* and *cons* to be considered. For example, the Authorities would have carefully to consider the question of gas lighting being superseded by electricity. This would certainly diminish the value of the old plant; but there would then, in his opinion, be brought into prominence another view of the

value of gas-works, to which little attention had been directed by the present Gas Companies. If electricity were introduced, power would be required to develop it, and this power could only be developed by supplies of water or fuel. If water were used, an equivalent charge could be made for its consumption, and the gas-works devoted to the supply of gaseous fuel, which, by a modification of the existing apparatus, might be rendered for all domestic purposes at a less cost than the same results could be obtained from coal. The present Plymouth Company, although supplying gas at a less cost than any other works in the kingdom, were so well satisfied with the results obtained that they did not offer any inducements for the extension of the use of gas as fuel, and had a large proportion of their plant idle half the time. If gas were supplied for heating purposes, for domestic and some manufacturing uses, at a sufficiently low price to supersede the use of coal, the demand for gas would increase so largely that additional capital would be required to extend the works. Three times the present consumption of gas, however, would involve but a limited increase of plant, while the same distributing service would suffice, and the capital required could readily be obtained at a small interest. At the works the whole of the residual products should be treated, and made marketable. The gas liquor should be converted into sulphate of ammonia, for which there was an unlimited demand. Corporations should also convert the tar into the best saleable products, obtaining pitch, anthracene, naphthaline, heavy oils, benzoles, and coke. By consuming their own coke, a glut of the outside coke market and a reduction in the value would be prevented. If the consumption of coal in private houses were superseded, the smoky atmosphere of the town would be cleansed, its sanitary condition improved, and all the ammonia of the coal now burnt in private houses would be utilized. Moreover, one of the great troubles of modern life would be lessened; for by the abolition of the present fireplace, and avoidance of consequent dirt, one servant would be able to do where two were now required, or, at least, one out of three. The town, having an interest in the success of the works, instead of sending to Caithness for paving its streets, would use up pitch and tar freely for making even better roads than the stone made. Means of profitably investing and utilizing capital were needed in Plymouth, and it only wanted a small share of the faith and energy so splendidly displayed in the histories of the pioneers of the gas, paraffin, and petroleum interests, of a Murdoch, and of a Young, to assure the successful issue which he had endeavoured to suggest.

#### LOCH KATRINE WATER.

Professor E. J. Mills, D.Sc., F.R.S., has made his Annual Report on the quality of the water obtained from Loch Katrine for the supply of Glasgow. The report refers to the twelve months from March, 1877, to February, 1878, inclusive. The composition is represented in parts per 100,000. These figures can be converted into grains per gallon by multiplying by seven and dividing by ten:—

Mean Composition.—The mean composition and the mean departure therefrom are as follow:—

	Compo- sition.	Mean Departure.	Mean Departure Per Cent.
Total solid impurity . . . . .	2·960	0·350	12
Organic carbon . . . . .	0·186	0·026	14
Ditto nitrogen . . . . .	0·011	0·008	76
Ammonia . . . . .	0·000	0·000	0
Nitric nitrogen . . . . .	0·004	0·001	25
Total combined nitrogen . . . . .	0·016	0·009	56
Chlorine . . . . .	0·670	0·060	9
Hardness (total) . . . . .	0·950	0·210	22
Mean . . . . .			27

By way of contrast, the corresponding figures for last year are appended:—

	Compo- sition.	Mean Departure.	Mean Departure Per Cent.
Total solid impurity . . . . .	2·750	0·410	15
Organic carbon . . . . .	0·142	0·020	14
Ditto nitrogen . . . . .	0·021	0·018	86
Ammonia . . . . .	0·001	0·001	100
Nitric nitrogen . . . . .	0·002	0·002	100
Total combined nitrogen . . . . .	0·024	0·019	79
Chlorine . . . . .	0·740	0·040	5
Hardness (total) . . . . .	0·460	0·230	50
Mean . . . . .			56

From these results it appears that, very roughly speaking, the variation in the composition of our water supply has been about half as great this year as last.

Total Solid Impurity.—This was at a minimum (2·20) in March, and at a maximum (4·24) in September. In the latter month its amount was enhanced by the presence of a number of organic particles and fibres, among which some diatoms and encysted organisms were observed. These organisms ceased to be found in a very short time. Their exceptional presence may, perhaps, have been due to a sudden inrush from some underground spring.

Organic Carbon.—The variation in the organic carbon again very nearly coincides with that of the total solids, and is within the margin of variation of last year. Its actual amount has, however, been increased. Minimum (0·131) in April, maximum (0·258) in November. The maximum in 1876 was (0·188) in November.

Organic Nitrogen.—The organic nitrogen has this year been reduced to almost exactly the amount of last year, and is a very small quantity for a peaty water to contain. The cause of this reduction is not obvious. In April, May, and August none was present; the maximum occurred in December (0·028). The general ratio of organic carbon to organic nitrogen is nearly 17 to 1, considerably more than twice as great as in the first year's report. The normal low value of about three to one in thoroughly oxidized waters, which was thrice attained in 1876-7, was not even approached during the last yearly period, thus showing the prevalent absence of any powerful oxidizing influences.

Ammonia.—The actual amount has been throughout extremely small. It was, in fact, absent on every occasion of analysis, except in March and October, being a maximum (0·003) in March.

Nitric Nitrogen.—The quantity of nitric nitrogen, on the other hand, is twice as great as before, and its variation, as might have been expected, has been reduced to one-fourth. The minimum (0·002) was in September; the maximum (0·005) in October, January, and February. As in the case of the organic nitrogen and ammonia, a decided improvement is here visible.

Total Combined Nitrogen.—The total combined nitrogen has been reduced to two-thirds of its previous amount. The minimum (0·003) occurred in April and May; the maximum (0·034) in December.

Chlorine.—This constituent is the most stable in amount of all those for which Loch Katrine water is examined, and is, as before, the least variable.



The minimum (0.50) was in February; the maximum (0.75) in May and July. During the last three months the chlorine in this water has undergone a perfectly steady diminution. This is probably due to the great prevalence—about 45 per cent.—of northerly and easterly winds during the previous nine months. Hence the increased variation per cent. given in the table.

**Hardness.**—The hardness is about double that of last year, and its variation has been reduced to one-half. The minimum (0.55) was in September; the maximum (1.43) in March.

**Climatic Influences.**—During the last yearly period the peculiar chemical influence of summer has not been traceable in this water. Our Western Highlands were, in fact, practically without that season; while the Metropolitan waters, enjoying its effect, were on several occasions not only very much freer than our own from organic impurity, but exhibited the then "normal" low ratio of organic carbon to nitrogen. North and east winds were prevalent during last spring, and, subsequently, the summer was inordinately overcast, and the remainder of the yearly period has been the subject of much atmospheric disturbance. All this has had its natural effect upon the water, which has, on the whole, been more coloured, less oxidized, less chlorinated, and more charged with suspended matter than during the preceding year.

**Filtration.**—It will have been inferred from what has been stated that the Loch Katrine supply—even taking its last year's condition as a standard—has not been so satisfactory as if the water had been filtered. The occasional state of the water has been such as to induce the reporter, during last year, to draw prominent attention to the great advantages of filtration, more especially when it is also considered that in 21 out of 26 reports by Professor Bischof, colour, or turbidity, or both, were noticed in the water. That filtration could be effected with ease by our own Local Authority is certain, and there is reason to suppose that it was originally intended to be done. The New River supply to London amounts to nearly the same as our own, and it is efficiently filtered. On the other hand, most householders have it in their power, by means of domestic filters, to make perhaps a greater improvement in the water than could be done by the Corporation itself. An ordinary charcoal filter, for example, not only removes suspended muddy particles, fibrous matter, and insects, but causes the disappearance of about two-thirds of the organic carbon, and the whole of the peaty colouring matter; its action being at once mechanical and chemical—in the latter case a partial oxidation occurring. The filtrate has a lustrous and brilliant appearance, which is impossible in an unfiltered peaty water. We have also to remember that Loch Katrine water is polluted with sewage, both from the hotel and the houses on the river; and while it is our serious business to consider whether this pollution and the possible distribution of fever germs through our vast population ought not to be summarily arrested, a nearly complete, if not perfect, remedy for a small pollution is to be found in a household filter. The reporter earnestly submits for the consideration of competent persons the possible effects of a single case of enteric fever in either of the houses draining into the water supply; especially when we bear in mind the comparative absence of plant life in the water, and the circumstance that any official control over such discharges is apparently out of the question. Household filters again are capable of absorbing the small quantities of lead which it is easy to find in Loch Katrine water after prolonged standing, even in old leaden service-pipes. The reporter has the satisfaction of knowing that since attention was drawn to this subject, there has been an increased use of filters in Glasgow. It is obvious that he who uses a filter diminishes his personal risk.

**Note.**—The monthly reports are issued for the general service of the public, and are recorded by the Registrar-General. They are necessarily technical in their nature; and while it is presumed that every reader may observe them with interest, it must not be supposed that every reader can form a right judgment upon them. This can only be done by professional chemists, or persons possessing equivalent information. The reports are periodically perused by skilled chemists in this country; and no vital change in the composition of the water would be allowed to pass without inquiry. Such matters, however, are not suitable for newspaper discussion, and the reporter has consequently felt it his duty to pass over in silence some criticisms which have appeared on the part of non-chemical correspondents in the local press. He wishes, in conclusion, to draw attention to the valuable analytical process contrived by Frankland and Armstrong, of estimating organic carbon and nitrogen; and to point out its beautiful correspondence with the known influence of climate, both this, and last years, and in the Loch Katrine district, as a fresh illustration of its accuracy and usefulness.

#### THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is no specially new feature to notice with regard to the coal trade of this district since last week, except that the better classes of round coal are now moving off less freely, and where the pits are not being put on short time considerable stocks are accumulating. Nominally prices are without change, but there is a general want of firmness in the market, and it is only in very exceptional cases that anything like fixed rates are adhered to. For all classes of round coal the demand is extremely small, common coal is very difficult to sell, and engine classes of fuel are being thrown upon the market by the present unsettled condition of the Lancashire cotton trade. Slack, suitable for brick-making, is in fair demand, but other sorts are only in very moderate request. The quotations at the pit mouth remain about as under:—Good Wigan Arley, 9s. to 10s. per ton; Pemberton four-feet, 7s. 6d. to 8s.; common Arley, 7s. 6d. to 8s.; common round coal, 5s. 6d. to 6s. 6d.; burgs, 4s. to 5s.; and good slack, 3s. to 4s. per ton.

The necessity of a reduction in wages is being more generally discussed, but as yet no definite action has been proposed.

In the iron trade there has been little or nothing doing, and prices, if anything, are easier. Lancashire makers of pig iron, although they still maintain their list prices, are more disposed to give way slightly to secure orders, and Lincolnshire iron is being pushed here at extremely low figures. For manufactured iron late prices are still asked. Lancashire and Middlesbrough bars, delivered into the Manchester district, being quoted at £6 2s. 6d. to £6 5s. per ton, and North Staffordshire ditto at £6 7s. 6d. per ton, but for good specifications rather less money would be accepted.

Works are all very slack, and many of them are being stopped for the greater part of this week for the holidays.

#### THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the North was pretty steady last week. The only feature of special interest was an order for 100,000 tons of coal, which came to Sunderland to be shipped immediately, to the order of the Russian Government, for the Baltic. Best gas coals show the ordinary spring shipments. There has been an improved demand this week for a better kind of second-class coal. Best steam coals are in fair demand. Prices are little altered from last week. The coasting business is moderate. The

supply of small sailing tonnage has been good. The coasting orders in the market have been about an average, and freights thence have been unchanged. The shipments of coal by steamer have greatly improved, and with the large orders for the Baltic which are in the market, steam tonnage will be rapidly taken up. Several large British steamers, which usually carry out coals to the East Indies, have been engaged to convey native troops and horses from India to Malta and Gibraltar. Rates for steamers are, therefore, likely to keep firm for some time. The manufacturing trade of the Tyne and Wear was very little changed from last week. Timber and house-building material are lower in price. Some cargoes have been stored; some were cargoes of fire-bricks and fire-clay. Goods have been shipped. The foundry and iron trade is a little better.

#### TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The programme of business for the half-yearly meeting of the West of Scotland Gas Managers Association, which is to be held in Paisley next Thursday, has just been issued. It is a very interesting and attractive "bill of fare," and will, doubtless, bring out an excellent attendance of members. Of course, the Corporation Gas-Works will be visited, with the view, more especially, of the members seeing in actual operation Mr. Hislop's process for revivifying foul gas lime. Altogether, the meeting bids fair to be a marked success.

At an ordinary meeting of the Town Council of Edinburgh, held on Tuesday, the 16th inst., it was reported by Mr. J. Falconer King, City Analyst, that on the 26th of March the gas supplied by the Edinburgh Gas Company was equal to 29.7 standard candles, and that supplied by the Edinburgh and Leith Company to 28.5 candles.

The illuminating power of the gas supplied during the month of March to the town of Cupar, Fifeshire, at the standard rate of consumption, as ascertained from testings made at three different times during the month, was as follows:—Maximum, 28 candles; minimum, 25.40 candles; average, 27 candles. This return is given on the authority of Mr. William Reid, who is, I suppose, the official Gas Examiner for the Town Council.

Dr. Wallace's report on the illuminating power of the gas supplied in Glasgow during the week ending the 13th of April shows that the minimum over the four testing-stations ranged from 25.13 candles to 26.59 candles; the average from 25.47 candles to 27.29 candles; and the maximum from 25.87 candles to 28.85 candles. The best results for the week were obtained in the western or Partick district.

On Monday, the 15th inst., the Shareholders of the Kirkintilloch Gas Company held another extraordinary general meeting, at which the resolution quoted in last week's "Notes" was unanimously confirmed. The transference of the gas supply undertaking to the Burgh Commissioners will now, doubtless, soon become an accomplished fact.

I referred last week to the progress of gas affairs at Kilsyth, a thriving town which is about to be brought for the first time into direct railway communication with Glasgow; but while mentioning that the dividend just declared was 10 per cent., I did not take any notice of the price of the gas. As it is not stated in the recently-issued statistical report compiled by the officers of the West of Scotland Gas Managers Association, it may be worth while now to mention that it is 5s. 6d. per 1000 cubic feet.

At a special meeting of the Wishaw Gaslight Company, held on Thursday night—Mr. John Wardrop, Chairman of the Company, presiding—it was unanimously resolved to sell the gas-works to the Wishaw Police Commissioners, and the Directors were empowered to conclude the necessary negotiations.

On Monday, the 15th inst., an ordinary meeting of the Glasgow Corporation Water Committee was held—Lord Provost Collins presiding. It was reported that there was 101 days supply of water in the lochs; in Mugdock reservoir, 13 days supply; and in the Gorbals reservoirs, 174 days supply; and that the quantity sent into the city during the preceding fortnight averaged 32,760,000 gallons. The revenue on the 8th of April was £121,286, being an increase of £1793 on the revenue at the corresponding date of the previous year.

It has just been officially reported that the total consumption of water in the city of Aberdeen, as measured at the reservoirs for one complete day of 24 hours, was 4,235,260 gallons, of which 4,010,800 went from the low service reservoir, and 224,460 from the high service reservoir. The water in the river at the intake at Invercarnie was reported by the sluice-keeper to have been "very clear" on 86 days of the past quarter, and "clear" on five days. It was not "brown" at any time during the quarter.

It was reported to the Greenock Water Trust last Tuesday that the quantity of water in store in the various reservoirs belonging to the Trust was 467,915,938 cubic feet, or 134 days supply for all purposes.

The proposal to have the water supply undertaking of the Rothsay Water Company transferred to the Municipal Authorities of the town, prior to the latter proceeding with any new works that may be required for the higher districts of the town, is now assuming a definite shape. It is likely that the Company will ask £25,000 as the price of the works; but if the proposal is favourably received by the ratepayers, there will doubtless be an arbitration, for the purpose of fixing the price between buyers and sellers.

Considerable depression was experienced in the Glasgow pig iron market during the past week, and prices declined on Thursday afternoon to 50s. 8d. cash for sellers, and 50s. 7½d. buyers.

In the coal market there is an increasing scarcity of orders, even though they are now taken at exceptionally low prices.

**EUFION FUEL AND GAS COMPANY, LIMITED.**—A first dividend of 5s. in the pound has been declared to the creditors of this Company, payable at the offices of Mr. James Cooper, the official liquidator, on Saturday next and the following Saturday.

**HULL GAS SUPPLY.**—Mr. James Baynes reports that the gas sent into the district of Sculcoates and Myton during March, by the British Gas Company, gave the following results, free ammonia and sulphuretted hydrogen being at no time present to the ordinary tests:—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16.30	15.21	15.91
Grains of sulphur per 100 cubic feet	28.20	26.00	27.00
Grains of ammonia per 100 cubic feet	—	—	50

**WALSALL SEWERAGE.**—The Local Government Board have forwarded to the Town Clerk of Walsall another letter with reference to this scheme, in which they say: "The second paragraph of section 3 of the Rivers Pollution Prevention Act, 1876, provides that where any sewage matter flows into a stream along a channel used at the time of the passing of the Act for conveying such sewage matter, it shall be sufficient if the best practicable and available means are being used to render the sewage harmless; but the effect of the first paragraph of the section is absolutely to prohibit the discharge of sewage into a stream through a channel first used for the purpose of conveying such sewage since the Act passed. The difficulty which the Board feel in the present instance is whether, if the sewage is discharged into the stream through the proposed new



outfall, the case can be considered as coming within the terms of the second paragraph of the section referred to, or whether the more stringent requirements of the first paragraph must be complied with. Assuming, however, that the second paragraph of the section will apply to the case, the Board are not aware of any reason why the Town Council should not proceed with their scheme, as the Board advised that it may be regarded as affording, on the whole, the best practicable and available means for rendering the sewage harmless. The Board think it right to make these observations for the purpose of assisting the Town Council in determining upon the course they will take in the matter, but they must at the same time point out that unless a decision is arrived at on the subject, and communicated to the Board by the end of the present month, it may probably be impossible for the Provisional Order to be issued in time to be submitted to Parliament for confirmation during the present session." The letter was discussed at a meeting of the Council on Monday, the 15th inst., but no decision was come to, and the subject was again referred to the Local Government Board.

**EXHIBITION OF GAS APPARATUS, ETC., AT STOCKTON.**—A Fine Art and Industrial Exhibition was opened at Stockton, on the 3rd inst.—Mr. J. Dodds, M.P., presiding. The *South Durham and Cleveland Mercury*, in its account of the various exhibits, says: "The vestibule is chiefly devoted (in addition to several working models) to the display of gas-consuming apparatus, by Mr. William Ford, the Gas Manager to the Corporation, and of coal, its products and bye-products, provided by the Gas Committee of the Stockton Corporation, which proves a complete success, and attracts unusual attention, the entire undertaking having been carried out in the most complete and satisfactory manner. Many of the cooking ranges, stoves, &c., are to be seen in operation, and add considerably to the appearance and the comfort of the hall. There is a one-horse power Nottingham vertical gas-engine, made by Messrs. Simon and Son, and this is seen in operation with gas as motor, and its appearance gives every indication of the successful application of gas in this direction. The array of cooking, boiling, and heating stoves is a very comprehensive one, and includes illustrations of every use in the departments for which coal gas is applicable as a convenient substitute for coal. Messrs. Leoni and Messrs. Billing, of London, have each a large selection of these, some of them adapted for private use, and others suited for institutions, cookery schools, &c. Special attention, and much admiration, seemed to be bestowed on the patent calorifer of Messrs. Leoni, which are in operation on a raised platform at the north end of the vestibule, and present a wonderfully good and cheerful imitation of a coal fire. The ranges and stoves on view from Messrs. Wright and Mr. Prusset, of Birmingham, and Messrs. Beverley, of Leeds, are also much appreciated, each maker having his own variety of designs for utility and convenience. The cooking range shown by Mr. Charles Wilson, of Leeds, is a most complete thing in this way, and has been invented by him for schools of cookery, &c. A novel feature it possesses is a roasting gas fire, which can be made to throw out an intense heat. Mr. Wilson has also on exhibition a gas bath and a lace-singeing machine, both of which are much inspected, as is also the calendaring machine sent by Mr. Hepworth, of Carlisle. There is also a numerous display of small atmospheric stoves for broiling, grilling, stewing, heating plates, heating irons, &c., and they are in all shapes and sizes. The ironing table of Mr. Paris, of Upton, is the subject of considerable attention. The novelty of it consists in the arrangement by which a mixture of gas and air is pumped into the hollow centre of the smoothing iron, where it is kept burning all the while the iron is in use, and keeps the iron constantly hot. The iron-heating apparatus of Mr. Ezard, of Manchester, is an adaptation of Wallace's atmospheric burner, by which the irons (hollow in themselves) are heated. A small table is devoted to exhibits from Mr. Fletcher, of Warrington, the whole of which are of a nature suitable for experimenting or laboratory work, and consist of hot-blast blow-pipes of special makes and different sizes, hand blowers, foot blowers, furnaces of different kinds, ingot melters, &c., &c., a very interesting table to those having any knowledge of chemistry. A beautiful show of burners, globes, shades, &c., from Mr. W. Sugg, of London, and the Silber Light Company, is arranged all the way along the vestibule, and has a very pretty appearance. Some of Mr. Sugg's are most beautifully hand-painted in brilliant colours and designs, and are objects of much admiration. Messrs. Cowan, of Edinburgh, have on view two beautiful models of gas-meters, one wet and one dry. Both of them are formed as much as is possible from glass, so as to allow an inspection of their internal arrangements for measuring and registering the quantity of gas passed, and they are objects of much interest. On a raised platform at one end of the vestibule there is exhibited an Evans photometer, by means of which the illuminating power of gas, as compared with sperm

candles, is determined; and there is also a jet photometer for a somewhat similar purpose, both of them having been removed here from the gas-works, where they are regularly used. Having now cursorily described the gas-consuming apparatus, there is left us to allude to the instructive and interesting table devoted to gas coal, its products and bye-products. This is really a beautiful display, and arranged in the most instructive manner. There are samples of coal from which is extracted all the other exhibits, such as coke, tar and ammonia, and their different constituents. Coal tar and its almost innumerable products, ammonia and its many salts, oxide of iron, used in gas purification, and samples of the valuable products derived from it thereafter, are here shown in a most interesting manner, and much pleasure is expressed with the beautiful and brilliant tar dyes and colours. This table, to any one with chemical knowledge, is a most interesting and unique display, most perfect in detail, and comprehensive in its nature, many of the samples being both rare and expensive."

## Register of New Patents.

### APPLICATIONS FOR LETTERS PATENT.

- 1470.—BAILEY, W. H., Salford, Lancs, "Improvements in cocks and taps." April 12, 1878.  
 1481.—BARLOW, A., Tonge, IDEN, W., and MILLS, H., Chadderton, Lancs, "An improved universal joint for pipes, used for the conveyance of water, steam, gas, and other fluids." April 18, 1878.  
 1494.—HOLME, J. E., Hull, Yorks, "Improvements in apparatus for registering the flow of liquids." April 15, 1878.  
 1504.—WANKLYN, J. A., and COOPER, W. J., Westminster, "Improvements in the method of determining organic matters contained in solutions." April 15, 1878.  
 1509.—GEDGE, W. E., Strand, London, "An improved water-meter." A communication. April 16, 1878.  
 1511.—WALDRON, E., London Road, London, "New or improved rotary pumps or engines applicable for transmitting power and for compressing or exhausting air or gas, and also applicable as a liquid or fluid meter." April 16, 1878.  
 1534.—COCKEY, H. and F. C., Frome Selwood, Somerset, "Improvements in wooden grids for gas purifiers." April 17, 1878.  
 1540.—OWEN, S., Coventry, Warwick, "Improvements in and connected with modes and apparatus for opening and closing cocks and valves, especially applicable to the lighting and extinguishing of street and other lamps." April 17, 1878.  
 1542.—LAKE, W. R., Southampton Buildings, London, "Improved apparatus for regulating and controlling the pressure and quantity of gas supplied to gas-burners, and for other like purposes." A communication. April 17, 1878.  
 1556.—GREEN, H., Preston, Lancs, "Improvements in apparatus for opening the supply of gas to burners, igniting the gas, and shutting off the supply." April 17, 1878.  
 1564.—LAKE, W. R., Southampton Buildings, London, "Improvements in apparatus for igniting and extinguishing gas by electricity, parts of which improvements are applicable in the employment of electricity for other purposes." A communication. April 18, 1878.  
 1582.—ROGERS, J. E., Smethwick, Stafford, "Improvements in adjustable spanners or screw-wrenches, and in pipe-tongs, and in combined pipe-tongs and pipe-cutters." April 18, 1878.  
 1585.—JOHNSON, S., Wood Green, London, "Improvements in apparatus for supplying water-closets with deodorizing and disinfecting material, and for purifying water in filters, cisterns, or other vessels." April 18, 1878.

### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

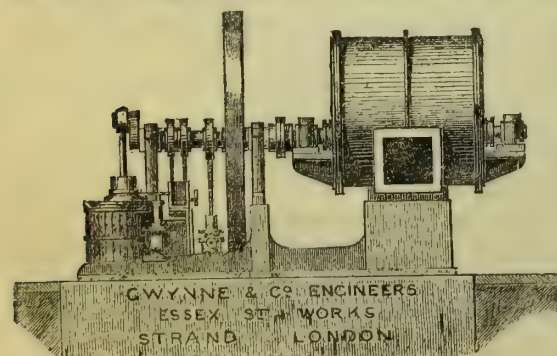
- 3900.—THOMPSON, W., and MAW, G., Sheffield, "Improvements in means and apparatus for generating heat by gas and air, applicable to stoves and other purposes." Oct. 22, 1877.  
 613.—PEARSON, H. J., Beeston, Nottingham, "Improvements in valves." Feb. 14, 1878.  
 670.—SKINNER, H. E., Borough, London, "New or improved arrangements for pumps and exhausters." Feb. 18, 1878.

### PATENT WHICH HAS BECOME VOID.

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.  
 1270.—ROBERTSON, J., "Improvements in water-meters." April 8, 1875.

The **GRAND MEDAL of MERIT** at the **VIENNA EXHIBITION**, and **TWO MEDALS** at the **PHILADELPHIA EXHIBITION** have been **AWARDED** to **GWYNNE & CO.** for **GAS-EXHAUSTERS, ENGINES, and PUMPS;**  
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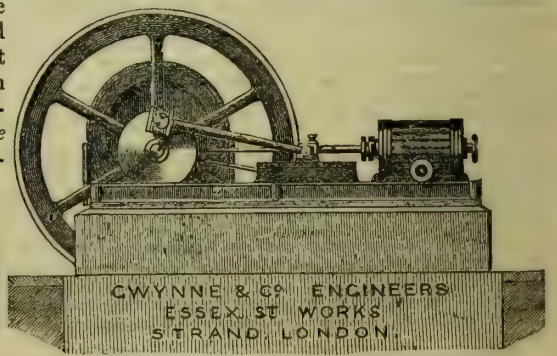
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52,500 EXHAUSTER, with Horizontal Engine combined.



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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

NOTE.—We have not space for your communication. Several communications have reached us too late for insertion in the present number.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 30, 1878.

Circular to Gas Companies.

It may be that, after all, a complete Municipality for the Metropolis will be sooner arranged than many people suppose. We are credibly informed that at this moment the Corporation of the City of London have under their consideration a scheme which proposes to constitute the several metropolitan parliamentary boroughs into wards, which will dovetail into the City arrangement. At present, of course, no details are made known; nor is the authorship of the scheme announced, but it may be reasonably guessed that the distinguished Chamberlain of the Corporation, Mr. B. Scott, who is so profoundly acquainted with metropolitan local affairs, has something to do with the plan now propounded. It is not a novelty, for we are informed that it has been under consideration for the last eighteen months. It will probably be under consideration for many more months, and, perhaps, for several years; for so complicated a business is not likely to be settled within a short period. An immense amount of opposition is to be expected from the Vestries and District Boards, or, rather, from the small-minded Members of these bodies, who will fear to lose local influence, and their share in the profits of local jobbery. Thus we anticipate that great obstacles will be raised, even to the most carefully considered scheme for improving the local self-government of the Metropolis. At the best, it will take years before anything can be accomplished, and then, as hinted before, only with the support of a strong Government. It is well, however, that reforms should begin from within; they are then usually conservative, and not destructive; and for this reason we are glad to learn that the question of municipal extension has been taken in hand by the Corporation of the City of London.

It will be asked what this has to do with the Metropolitan Gas Companies. It may be nothing, it may be much. We remarked last week, that the fate of the Metropolitan Gas Companies is in their own hands. They have the chance of demonstrating

that they can do better for their Customers than any Municipal Authority, however constituted; but for this purpose they must be united. All that is to be gained by concentration of management under a Local Authority can be obtained by the complete amalgamation of the Companies, and this effected, we do not anticipate that any Municipality would attempt to disturb the amicable relations of the Company and the Consumer. The time, as we have said, is ripe for combination. A year or two will bring fresh Companies under modern legislation, and the opportunity will then, if not before, arise for considering how far additional unions may be advisable.

We are happy to learn that the new gas-works at Tunbridge Wells are in progress of construction. A very interesting meeting was held the other day, when a foundation or memorial stone was laid by Mr. Hunter, the Chairman of the existing Gas Company. We do not feel quite certain that the report before us gives us the full history of gas enterprise in Tunbridge Wells, for that town was one of the fashionable inland watering-places so much frequented towards the commencement of the present century, before seaside resorts became popular. But it would appear that the use of gas was introduced so recently as 1835, and then only by a private individual. In 1843 this very limited undertaking passed into the hands of the present Company, who did their best, and with success, to enlarge the undertaking. The difficulties in recent times which they have had to encounter, in consequence of the opposition of the Local Authority, have been recorded in these columns, but now, with a well-selected site and excellently designed works, parts of which have already figured in our "Treatise," Tunbridge Wells promises to be one of the best lighted towns in the kingdom.

The Town Clerk of Wigan, as will be seen in another column, is not satisfied with the decision of the Borough Magistrates, who inflicted a small fine on the Corporation for not depositing their gas accounts. We think a more careful study of the general Acts of 1847 and 1871, together with the Wigan Improvement Act, will satisfy him that the Magistrates were right. The former make no distinction between Companies and Corporations. The word "undertakers" evidently includes both. In 1847, we dare say, Corporations were not thought of, for very few possessed gas undertakings; but in 1871 purchases had become more common, and we imagine the Legislature fully considered their cases. The Wigan Improvement Act, like all special Corporation Gas Acts, certainly exempts the Corporation from the obligation of some of the clauses of the general enactments; but we do not make out that there is any exemption from the obligation to file accounts. In fact, clause 35 of the Act of 1871, which requires "the undertakers to fill up and forward to the Local Authority of every district within the limits of the Special Act, on or before the 25th day of March in each year, an annual statement of accounts made up to the 31st day of December then next preceding," is not one of the clauses which is excepted by clause 79 of the Improvement Act of 1874. It may, indeed, be supposed Parliament considered it advisable that Local Authorities should be required to deposit their accounts in a particular form, in order that the ratepayers might have full information as to the profits of their undertaking. If the Town Clerk admits that it may be useful to publish the accounts for the information of the Gas Committee, we deem it equally advisable that they should be printed for the satisfaction of the inhabitants.

It might be thought that at the present time the subsoil of our roadways and pavements was sufficiently occupied with gas-pipes, water-pipes, and telegraph wires; but it seems to be seriously proposed in Liverpool to add a fourth occupant. A great central station is suggested, where a number of dynamo-electric machines, driven, of course, by steam power, are to be placed, from which wires conveying the electric current should radiate to all parts of the City, where the electric light can be utilized. The idea looks very well on paper; but we fear that difficulties might arise in carrying the plan into execution. Foremost, we may take it, would come the expense, which the projectors evidently foresee; but this is met by the suggestion that water might be substituted for steam power, to supply which the tides might be laid under contribution. The project is, however, in a very crude state, and we do not think the Liverpool United Gas Company have any reason to fear the competition of the electric light. The Town Council, who are evidently desirous of experimenting with the light, may, however, make a note of it, perhaps, and decide on leaving the Company in undisturbed possession of their property.

We are sorry to see the excellently managed Plymouth Gas Company have been accused of supplying bad gas. It is, of course, the old story of bad burners, resulting in imperfect combustion. A consumer gets his ceilings blackened, and immediately



complains that the Company are supplying "dirty" gas. It is seldom possible to convince a man who is totally ignorant of the matter that the soot deposited on the ceiling is so much carbon wasted, which, if the gas had been properly consumed, would have added to the brilliancy of the light. One good thing we expect to result from the now frequent exhibition of gas apparatus, and that is the diffusion of useful knowledge on the subject of burners. We hope that at the forthcoming Birmingham Exhibition care will be taken to display a collection of good and bad burners, including some old and corroded metal burners still so commonly used, to show the necessity for the frequent examination of these instruments.

The Corporation of Ipswich have selected a very improper situation for a gas-testing station, and the Gas Company very properly object. Some in the Corporation argue that gas should be tested where it is worst; but there is no question of good gas in one part of the town and bad in another. To be fairly and properly tested, the gas should be taken from a main where there is a free circulation, and this the Ipswich Company insist upon, as would the Corporation if they possessed the undertaking. It would be most improper and unfair to test "dead" gas, which most likely has lost a portion of its illuminating constituents.

An old idea, it seems, has been revived, and it is again proposed to distribute water gas for heating purposes. There can be no doubt that, if a really practicable method for its production on a large scale could be devised, some economy might result from its use; but it would be at great risks. Everybody knows that carbonic oxide, which constitutes a large portion of the gas, is a deadly poison. It is, moreover, odourless, and, consequently, an escape would not be noticed. There is, therefore, the double risk of asphyxia from its presence, and of explosion in consequence of the mixture of hydrogen.

We are promised a new solution of the "sulphur" difficulty. Mr. F. J. Evans and Mr. W. T. Sugg have jointly taken out a patent for the "Manufacture of coal gas," &c., which includes a method of removing the impurities in crude gas. We shall publish a full description of the plan when the drawings necessary for the illustration of the mechanical details are prepared. In the meantime, we may give a brief outline of the system from a chemical point of view. The gas generated as usual in the retorts passes up the ascension-pipes, which have either been jacketed or coated with some non-conducting material, so that the gas is delivered into the hydraulic main at the temperature of about 200° Fahr. Simultaneously there is passed into the hydraulic main a stream of ammonia, either in a vapour form or solution, where it is brought into immediate contact with what we may call the nascent gas at a rather high temperature. This is considered favourable for the union of the sulphur compounds and carbonic acid with the ammonia. We confess to having some doubts as to whether or not carbonic acid will combine with ammonia at 200°; but, as regards the sulphur compounds, it may be that such a temperature rather favours the combination. This is a point, however, which can only be settled by experiments. From the hydraulic the gas passes on to a special apparatus, which will be duly described and figured. Here the tar is deposited, and then the gas goes on to the scrubbers, and whatever system of purifiers may be considered necessary. This is a very brief account of the plan, which is now, we believe, on trial at the Silvertown works, with what result has not yet been made known. We sincerely hope that it may prove a success, for it is calculated to relieve managers of many difficulties.

The above-mentioned plan has the merit of simplicity and cheapness, which we cannot say for another invention to accomplish the same object, which is made public almost at the same time. It is a process devised by "Julius Von Quaglio, Chief Engineer at the Gas-Works of Stockholm." This gentleman proposes to cause the gas, on its way, we presume, to the oxide or lime purifiers, to traverse pipes heated to redness, and stuffed with rolls of platinum foil, or, indeed, with thin *laminae* of any one of the platinum series of metals, including the most expensive. It is only fair to say that the first outlay will be the chief cost, for the action of the purifying metal would, like Tennyson's brook, "go on for ever." The same, however, must be said for the Rev. W. B. Bowditch's lime. The reactions are simple, bisulphide of carbon is decomposed, and sulphuretted hydrogen is formed, to be removed at a subsequent stage. M. Quaglio's system is not likely, we fear, to be extensively adopted.

An enterprising American editor has taken the pains to compile statistics on "American Gas Making,"\* an imitation, we

suspect, of the valuable annual report published by our friends, the West of Scotland Association of Gas Managers. The book we notice possesses much interest, but it mainly concerns Americans and Canadians. We have on previous occasions given a list of the prices charged for gas in the principal cities in the States, which must have staggered the consumers of this country. We learn from this compilation that the charge for gas to private consumers in the States and Canadas varies from 0·90 of a dollar per thousand cubic feet at Harrisburg, Pennsylvania, to 10 dollars—that is over £2 per thousand cubic feet—at Woodstock, Vermont. We wonder what London Vestrymen would say to paying 30·16 dollars a year each for public lamps, consuming three feet an hour, as they do at Brooklyn, New York, the illuminating power being fifteen candles. The quality of coals in America is necessarily very various. The editor has committed one fault—he gives us the amount of coal carbonized annually in the several cities and towns, and also the bulk of gas produced in the course of the year. It will be well if, in the publication of another issue, he will give, as now, the coal carbonized, and state the average quantity of gas produced per ton. In the present form he causes his readers to make a great many calculations.

The sixth Annual Meeting of the West of Scotland Association of Gas Managers was held at Paisley on Thursday last, under the presidency of Mr. James M'Gilchrist, and we shall, in due course, furnish a report of the proceedings on that occasion. We are gratified to learn that the meeting was, both with reference to the attendance of members and the interest maintained throughout the sittings, a complete success.

The second General Meeting of the North of England Gas Managers Association was held at Newcastle-on-Tyne on Saturday last. The address of the President (Mr. Warner), and a report of the proceedings, will find a place in our columns as early as possible.

The current monthly number of the "Treatise on the Science and Practice of the Manufacture and Distribution of Coal Gas" completes the first volume of the work. We are fain to admit that the book has grown to dimensions which we did not originally contemplate, but materials have come so fast to our hands which we have deemed it of importance to insert, that a great extension of our original design became unavoidable, in order that the information contained in the work might be brought down to the most recent date. To mention the numerous friends from whom we have received assistance would occupy a large space, and we must leave a special recognition of their kind services until the work is finally completed. An advertisement by the Publisher, in another column, will inform our readers of the arrangements made for the issue of the bound copies of the first volume.

### Water and Sanitary Notes.

A RATING case, possessing some interest to Corporations having water undertakings, was recently heard before the Earl of Chichester and a full Bench, at Lewes. The Corporation of Brighton include within their water limits the parish of Preston, which is rated for poor law purposes to the Steyning Union. There was no question about the rateable value of the Corporation plant within the parish; but, as our readers will remember, the Corporation of Brighton make a considerable profit upon their undertaking, and recently the Water Committee transferred £2000 of these profits to the credit of the borough fund. It was to include a portion of this sum in the assessable value that the Guardians of the Steyning Union took proceedings. There was another point raised; but the interest centres in the claim to include the £2000 as adding to the value of the undertaking. In this contention the Guardians were successful. It follows that, if this case be not carried to a higher Court, profits of gas and water undertakings transferred to the borough fund are an element of rateable value. The hypothetical tenant would, of course, take account of the £2000 when agreeing for a lease of the undertaking.

The Metropolitan Board of Works are about to introduce a new Thames Floods Prevention Bill. They still cling to the notions which prevailed in the Board last year, and decline to make the cost of the necessary works for the prevention of these floods a charge upon the whole Metropolis. They still desire to make the owners of property, and the riparian Vestries and District Boards, chargeable for the cost of the works, which, when constructed, are to be under the supervision of the Metropolitan Board. They also agree to be responsible for damages which may be caused by an overflow in future; but they propose to distribute the cost of such damage among the riparian Authorities. We doubt whether this is a measure that will satisfy the Home Secretary, and we fully expect, therefore, that it will meet with

\* "American Gas Making; a Compendium of Useful Information relative to Price Charged for Gas, Quantity Annually Made, Amount and Variety of Coal Used, Price for Public Lighting, &c., together with the Population of the Principal Cities and Towns." By Frederick E. Seward. New York. 1878.



the opposition of the Government. It would be far better if the Metropolitan Board would fall in at once with the suggestions of an Authority superior to themselves, and loyally carry out the work they have been, in a measure, directed to do.

We have as yet no knowledge of the way in which the award sent "greeting" by Mr. W. H. Higgins, the Umpire, to the joint Boards of Stockton and Middlesborough has been received. It must have carried great consternation to the Committee; but still they have a chance of making some good of the undertaking. It must for a few years be a heavy burden; but with more prosperous times and a great revival of trade, the works may be expected to prove remunerative with no very heavy rates.

Lambeth is protesting against the increased rates levied by the Southwark and Vauxhall Company. There can be no doubt that, for some years past, the district has been under-assessed, and now that the Company are in what we may call low water, it is not unreasonable that they should endeavour to increase their revenue by all legal means. They are fully justified in the step they have taken. Of course, it is disagreeable to have to pay increased charges; but such *désagréments* happen to people every day, and they are borne with composure, if not with satisfaction.

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### HOW NOT TO DO IT.

SIR,—Under this heading, in your JOURNAL of April 23, "A Country Gas Manager" asks, Can a Consumer compel a Gas Company to supply him with gas? I reply that the Gas-Works Clauses Act, 1871, clause 11, gives a Consumer that power, provided he is within 25 yards of the Gas Company's mains.

It is stated that a certain cottage requiring a supply of gas is beyond 30 feet of the Company's main, and is, therefore, 15 yards within the distance named in the Act. In such a case he can demand a supply of gas, but would be liable to pay the cost of the extra 15 feet of main, and for any length of service-pipe across his private ground to the cottage. The Company can, moreover, demand a guarantee that the Gas Consumer shall take, and pay for, a supply of gas for at least two years, and that the rent payable on the same shall be not less than 20 per cent. on the outlay incurred by the Company, and the Company can secure this payment by requiring a deposit for the gas to be supplied. If a Tenant is willing to make these payments, a Magistrate's summons would settle the matter; but surely, if the Manager of the gas-works shows his Directors, in clear figures, that the consumption will warrant the outlay, no such pressure would be necessary; and as I think it unlikely they would allow such a case to come into Court, the "Country Gas Manager" may, therefore, ask in vain for any legal decisions on the point.

Lower Sydenham, April 26, 1878.

MAGNUS OHREN.

SIR,—There was a letter in your last JOURNAL, from a "Country Gas Manager," respecting clause 11 of the Gas-Works Clauses Amendment Act, 1871, to which, if you can find the space in your next, I should like to make some observations in reply.

I will endeavour to be as brief as possible, for my own sake as well as yours; but to answer the matter fully, must, I fear, encroach somewhat largely upon your indulgence.

Reciting, then, only so much of the clause as is necessary for this purpose, it is as follows:—

"Supply of Gas to Owners and Occupiers of Premises.

"The undertakers shall, upon being required so to do by the owner or occupier of any premises situate within 25 yards from any main of the undertakers, or such other distance as may be prescribed, give and continue to give a supply of gas for such premises, under such pressure in the main as may be prescribed, and they shall furnish and lay any pipe that may be necessary for such purpose, subject to the conditions following (that is to say):—The cost of so much of any pipe for the supply of gas to any owner or occupier as may be laid upon the property of such owner or in the possession of such occupier, and of so much of any such pipe as may be laid for a greater distance than 30 feet from any pipe of the undertakers, although not on such property, shall be defrayed by such owner or occupier. Every owner or occupier of premises requiring a supply of gas shall, with other things, enter into a written contract with the undertakers (if required by them so to do) to continue to receive and pay for a supply of gas, for a period of at least two years, of such an amount that the rent payable for the same shall not be less than £20 per centum per annum on the outlay incurred by the undertakers in providing any pipe to be provided by them for the purpose of such supply."

The operation of this clause may be described thus:—If a house is within 25 yards (75 feet)—not 30 feet, as stated in the letter—of a Company's mains, or if the house has a garden, forecourt, or open space in front, and the outer wall of such garden or forecourt, or the outer boundary of such open space, is within the 75 feet, the occupier of the premises can call upon the Company to give a supply, and to furnish and lay a service into such house, or into such garden, forecourt, or open space, as the case may be, for that purpose, and the Company, by clause 36, are liable to a penalty of 40s. per day for every day they neglect or refuse to give such a supply.

The 30 feet has no bearing upon this point; it relates solely to the cost of furnishing and laying down the service for such supply, which is specially provided for as under. The first 30 feet to be furnished and laid at the expense of the Company, and all the rest at the expense of the occupier.

When the service is laid into the premises—that is, the house, or garden, and so forth, as the case may be—the Company's obligation ceases, the occupier may then either do the other part himself, or

employ the Company to do it for him, but in either case at his own expense.

The provision about giving security for a rental, equal to 20 per cent. on the outlay incurred by the undertakers, for two years originated in the Metropolis Gas Act, 1860; but as, under that Act, the Companies were compelled to furnish and lay down 150 feet at their own cost—and the plying in London is much more costly than in the country—the provision in that case was of some value; but with the length reduced from 150 feet to 30 feet—an outlay of no more than 15s. or 20s. at the outside—it is not worth a moment's consideration one way or the other.

It has always been contended that all Companies under statutory regulations are by implication, and without express statutory provision, under an obligation to furnish a supply of gas to all persons requiring it in their district, without distinction or favour.

When the Act of 1871 was under consideration, a deputation from the Gas Companies had several interviews with the Board of Trade respecting it. It was then urged upon the Board that if the Companies were under this implied obligation, they might be called upon to extend their mains into places where there would be no possible chance of their ever becoming remunerative, and consequently there ought to be some limit to it. The clause was therefore altered so as to make a limit of 25 yards, and leave any further extension of the mains at the discretion of the Companies.

To prevent any misunderstanding upon this point, I will endeavour to explain it in another way, as thus: Suppose a main to be laid for some distance through a large thoroughfare, and to terminate at, say, the eastern end of it, the intention was that persons living 25 yards from that end should not be entitled to call upon the Company for a supply, and thus to compel them, as it were, to extend their mains; but it was not intended to relieve the Companies of any obligations they were under at that time, implied or otherwise, with respect to premises on the line of main.

The clause, however, as it now stands, would seem to justify a Company in refusing a supply to any premises, even on the line of main, that might happen to be more than 25 yards from it.

As the Companies are protected by the provision, that in no case shall they be under an obligation to supply more than 30 feet at their own expense, it seems an absurdity to provide that they shall not be required to give a supply when the service would be more than 75 feet, even if the consumer was willing to pay for the service. Such a provision could only be prejudicial to the public, without being any benefit to the Companies.

As an illustration of the effect of this, suppose a Company, for some purpose of their own, laid their main on one side of a street, so that the houses on that side were all within 10 feet, while those on the other were upwards of 75 feet, the Company in such a case would be under an obligation to supply houses on one side, but at liberty to refuse a supply to the houses on the other side; or, suppose the case of two persons carrying on the same business in competition with each other, and living in the same street, with the main passing in front of both houses, but more than 25 yards from them, a Company might give a supply to one, and refuse a supply to the other. It is impossible to suppose that the Legislature, in granting powers to a Company to supply a certain district with gas, and thereby excluding all other Companies and persons from doing so, ever intended that a Company should have such powers as these; and yet, if we assume that the giving a supply beyond the 25 yards is entirely optional, and free from any implied obligation, it leads to all this and much more that would be equally unjust. If a case of this sort were brought before the Courts, all these considerations would have weight, and it is not improbable that, notwithstanding the 11th clause, the decision would be against the Company.

But, apart from all this what reason can there be for refusing a supply in such cases? Will any person who says they do not pay, undertake to show how he arrives at such a conclusion? The cost, as stated before, would be 15s. or 20s. for each house at the outside, and this, if charged to capital, would require a profit of only 1s. 6d. or 2s. per annum on each house to pay 10 per cent.

Will any gasman pretend that for every additional 10,000 feet of gas brought into his ledger he has to carbonize an additional ton of coals, or pay more wages, or put up more retorts, or enlarge his gasholders?

On the contrary, the half-yearly accounts show again and again that, while the consumption of coal has decreased, and the wages the same, more gas has been sold, and more rental received.

The truth is, that the plant, in almost all cases, is, as it ought to be, greatly in excess of the immediate requirements of the Company, and, so long as the supply is within the compass of the plant, extensions can be made to a very considerable amount, without any increase of cost whatever; and, rightly considered, extensions are almost wholly so much additional profit.

The greater the quantity of gas made with the same plant, the less the cost of the whole quantity made, and the less the quantity lost or unaccounted for. All Companies, therefore, great and small, ought to make every effort they possibly can to extend the supply, and not try, as the small Companies too frequently do, to restrict it. W. LIVESKY.

Gas and Water Companies Association, 5, Victoria Street, Westminster, April 29, 1878.

### THE USE OF SEA WATER IN GASHOLDER-TANKS.

SIR,—At present there is being put in for this Company a cast-iron tank, 81 feet diameter, 20 feet deep, with a gasholder 80 feet by 20 feet to work in the same. The excavation for the tank is nearly finished, and I send you a section of the soils we have passed through—viz., 6 feet of pure sharp sea sand, without a stone in it larger than a bean. Under this a bed of from 6 to 18 inches of gravel, from which came the water we have, occasioning a slip of the bank now and again. Under the gravel was a bed of very fine clay from 2 to 3 feet thick.

Under this clay we had very hard red boulder clay, what navvies would term "plum pudding." This clay stood very perpendicular when excavated. It was anticipated that, during the excavation, water would be abundant, and provision was made, in the specification, for



forming a drain to the harbour, a distance of a few hundred yards, so that the water to be pumped might be carried away.

The Contractor, at some expense, brought up the said drain deeper than I intended, thinking that the nearer to the bottom of the excavation he could bring his drain, the less the water that he would require to pump.

It turned out, however, that the water came from the gravel bed, and hence a 3-inch tile drain-pipe was carried round a scarpement, on the top of the hard clay stratum which conducted the water, and ran it into the side of the upstand of the drain-pipe without any pumping, save at high tides. The end of the pipe was nearly 4 feet above the drain. This pipe had to be plugged up whenever the tide rose above it. The water was then allowed to flow into a barrel below the bottom of the excavation, and from this was pumped up into the upstand of the drain and carried off to the harbour. In this way the water has been little trouble, and not much expense. I write this for the benefit of any who may be like situated, or have similar work to execute, and also to ask the following:—

*Query.*—Water is scarce in the locality. It takes over 600,000 gallons to fill the tank, but it could be filled through the tile drain from the harbour in a tide or two. Would the salt water injure the ironwork of the gasholder?

*Gas-Works, St. Andrew's, April 18, 1878.*

J. HALL.

#### HYDRAULIC LIFTS FOR PURIFIER-COVERS.

SIR,—I have no wish to detract from the claim of Mr. John Reid, of the Edinburgh and Leith Gas Company, as to his being the first to adopt the hydraulic lift for purifier-covers; nor have I any wish to call in question the statements in his letter of the 8th current, as it is well enough known that he explained his system at a meeting of Gas Managers at Perth, in 1872, when it was believed by those present that he really was the inventor of the system. But, nevertheless, is it not the fact that the same had been adopted at the Glasgow Corporation Gas-Works prior to 1870, the date of the specification he alludes to? That is a question which can easily be answered; and, as honour should be given to whom honour is due, I shall be glad to learn if such was the case, and, if so, to whom the credit in that case should be given.

The Manager of the Glasgow works can at once settle the point in dispute, and say whether Mr. Reid has any claim to the invention for which he has hitherto had credit.

*April 25, 1878.*

JUSTICE.

**REDUCTIONS IN THE PRICE OF GAS.**—The Swinton and Mexborough Gas Company announce a reduction of 3d. per 1000 from the 1st of July next. At Hexham the price has been reduced from 5s. to 4s. 7d.

**ROCHDALE CORPORATION GAS-WORKS.**—The *Rochdale Observer* of Saturday last remarks: "The ratepayers will be glad to learn that the gas profits for the year ending March amount to the handsome total of £8622. This large sum will, of course, be applied to the improvement-fund, which really means to the reduction of the rates. Such a result of the year's working is the more satisfactory because we had, in August last, a reduction of 6d. per 1000 in the price, and, owing to the depression of trade, we have had a falling off in the consumption amounting to about a million and a half compared with the previous year. In times gone by, the public used to regard a rise or fall in the consumption of gas as a fair indication of the prosperity or otherwise of the town, and it is no doubt a good gauge of our progress; but it often used to be accompanied by a falling profit instead of an increased one. We are now, no doubt, reaping some of the advantages of the improvements which were introduced some years ago, and which must have reduced the cost of manufacture. A reduction rather than an increase of the sale of gas this year shows the prudence and wisdom of the Committee in determining not to involve themselves in the gigantic outlay which the proposed scheme of erecting a new plant on another site would have entailed. The time will no doubt arrive when such an extension will be needed; but it is evidently not yet urgently required, and its postponement will give opportunity for the skilful and economical development of the present works."

**PRESTON GAS COMPANY.**—Mr. Carter, borough accountant, has issued his yearly summary of the accounts of the Gas Company for the year ending the 30th of November last. The total income was £56,976 0s. 6d., and expenditure £40,523 0s. 8½d., leaving a balance of net profit of £16,452 19s. 9½d. The dividends declared for the year (10 per cent. on A, and 7 per cent. on B stock) took up £17,145, which necessitated the withdrawal of £692 0s. 2½d. from the reserve, leaving that fund at date £22,985 14s. 10½d. The share capital of the Company was increased by a call of £9000 on the 1st of June, and a sum of £4930 borrowed on mortgage. The amount expended on this account up to the 30th of November, 1876, was £267,443 18s. 0½d., and during the year this was increased by £17,080 14s. 6d., of which £14,138 17s. 4½d. was on account of the new offices in Fishergate and extensions in Walker Street, making the outlay of capital on Nov. 30, 1877, £284,524 12s. 6½d. With regard to the gas supply, Mr. Carter shows that the total quantity distributed during the year to ordinary consumers amounted to 252,170,200 cubic feet, at a gross charge of £19,819 9s. 9½d., less £7554 12s. 2½d. in discounts, bad debts, and abatements, leaving the net amount received for gas for private consumption £12,264 17s. 6½d. The quantity supplied to street-lamps was 15,376,400 cubic feet, at a net charge of £2306 9s. 2½d. The average net price received for gas for private consumption was 40.22d., and that for public use 39.98d. per 1000 cubic feet. The Company's financial position is thus set forth:—Capital and liabilities, £293,902 12s. 0½d.; property and assets, works, &c., £284,524 12s. 6½d.; cannel and coal, &c., £8060 16s. 10½d.; sundries, £1317 2s. 7½d. The proportions of material used in gas manufacture during 1877 have been 31.21 per cent. of cannel, 11.87 per cent. of cannel slack, and 56.92 per cent. of coal. The total increase in the consumption of gas last year was 9,268,800 cubic feet; the increase in the borough and Fulwood being 8,275,700, and in the out-towns 993,100. The quantity of gas used in the street-lamps was 285,800 cubic feet less than in the previous year, and, with the 10 per cent. reduction, results in a net saving to the borough of £303 17s. 10d. The gross revenue shows a decrease of £220 9s. 9d., and the net profits a decrease of £1231 0s. 5d. The actual cost of producing the year's saleable quantity of gas, including interest on loans, maintenance of works, and all other expenses in connection with the working of the establishment, after deducting amount realised for residuals, was 2s. 4d. (28.02d.) per 1000 cubic feet, against 2s. 4½d. (28.88d.) in 1876. During the past ten years the Company have on four occasions resorted to the reserve-fund to make up the prescribed dividend—viz., in 1869, £1521; 1870, £15; 1874, £349; 1877, £692. In the other six years they have added to it—viz., 1867, £2143; 1868, £146; 1871, £4264; 1872, £5222; 1873, £2284; 1875, £128; 1876, £854.

## Parliamentary Intelligence.

### HOUSE OF COMMONS COMMITTEES.

TUESDAY, APRIL 2.

(Before Mr. LEATHAM, Chairman; Viscount HOLMESDALE, Mr. RALLI, and Mr. CHESTER MASTER; Mr. A. BONHAM-CARTER, Referee.)

#### LEA BRIDGE DISTRICT GAS BILL.

(Continued from p. 638.)

Mr. ROUND, on behalf of the parish of Walthamstow, said the objections urged by his clients were twofold. First of all they thought a statutory price even of 5s. was higher than it ought to be, although their objections were not so strong as when it was proposed that it should be 5s. 6d.; but, from the evidence which had been produced, no reason had been given why the Lea Bridge district should have—looking forward to the future—so large a margin in the difference of price as existed between West Ham and that district. The witnesses who represented Walthamstow were very anxious to explain what they thought had not been brought forward—viz., the extremely unsatisfactory way in which the Lea Bridge District Gas Company had hitherto dealt with them, and the indifferent gas with which Walthamstow had hitherto been supplied. They therefore thought the Company ought not to have any unusual parliamentary powers conferred upon them, they not having entitled themselves in any way to it. Beyond that point there was, however, a much larger question—the position in which the Walthamstow people would be placed by the passing of the Bill, which meant giving parliamentary sanction to the agreement which had been made between the two Companies. The meaning of that was that the two Gas Companies were to arrange between themselves, and to map out the districts suited them best, wholly irrespective of the consumers, who were the parties principally interested. So far back as 1856, the West Ham Gas Company asked for powers to supply the whole of Walthamstow, and, of course, after that it was impossible for any one else to apply for power to do the same. Subsequently, however, without any concert with the authorities in any way, they made an agreement with the Lea Bridge District Gas Company, saying, "Although Parliament has made this bargain with us, we propose to transfer a part of it to you"—whether it was the most valuable or the least valuable did not touch the principle. The proper course would have been for the parties to come before Parliament and say, "Undo what you did in 1856, and, under the circumstances, make it as it is desired by both parties." An application to that effect was made three years ago, but was rejected because Parliament decided to set its face against the Company moving out of their districts for their own immediate objects without the Consumers being in any way consulted. That was a very important principle, and therefore he asked the Committee, even if they passed the Bill, to cut out clause 64, which proposed to confirm the agreement. If the West Ham Company did not choose to supply Walthamstow, there was no power to make them; but in that case let the rights of the petitioners remain as they were. He asked the Committee not to give the Company parliamentary sanction; not to sacrifice the consumers for all time, when the circumstances might be such as would induce the West Ham Company to say: "We will supply you at Walthamstow." Witnesses would be called to prove they were willing to pay a somewhat higher price than 3s. 9d., because they thought the Company were entitled to something more because of the distance they would have to go. If the Committee passed the Bill, however, no inducement could be offered to the West Ham Company in the future, because the district would be by parliamentary authority placed within that of the Lea Bridge Company. It might be that that Company would supply at the same price as the West Ham, and, if so, the consumers would not lose anything; but he (Mr. Round) asked the Committee not to sanction any arrangement which would put it out of the power of the West Ham Company and his clients to come to some arrangement by which the latter Company could supply them. He did not ask the Committee to throw out the Bill altogether, but, when they had heard his witnesses, to take their evidence into consideration, and decide whether or not they could not, with perfect justice to the consumers, reduce the maximum price below 5s. It would be recollected that the price originally asked for was 5s. 6d., but, without any hesitation, it was brought down to 5s., and therefore, in all probability, the Company had made up their minds that a much smaller maximum would suffice. With regard to the agreement, however, it would be introducing a very bad precedent if it were sanctioned. When Parliament said a certain district should be apportioned to a certain Company, it was to be presumed it was so said in consequence of the facts having been fully gone into, and the Consumers consulted on the subject. Parliament had on one occasion declined to alter its decision, and no fresh circumstances had arisen between 1873 and 1878 to induce them to alter that decision. No possible harm could be done by refusing to give the Company parliamentary power, but an extremely bad precedent might be laid down by confirming the agreement. It might be said on the other side: "What is the use of leaving you as you are, you cannot compel the West Ham Company to supply you?" They would, however, take their chance, because they did not know what circumstances would operate in the course of time. As Walthamstow became more fully populated, there would be a greater inducement for the West Ham Company to go there; at all events, it was a matter in which the inhabitants were the parties principally concerned, and they thought there was an advantage in not having parliamentary sanction given to the agreement. It was, indeed, contrary to precedent, and would establish a vicious principle, to allow two Companies, behind the backs of the Consumers, to alter a district which Parliament had deliberately sanctioned.

Mr. Thomas Lavinton Cusley, examined by Mr. ROUND.

I am Chairman of the Walthamstow Local Board, upon whom rests the responsibility of lighting the streets, and generally with regard to the interests of the inhabitants. When the present Bill was first brought under the notice of the Local Board, they called a Vestry meeting, which was unanimous in deciding that the Bill should be opposed. After that, Board meetings were held, and a public meeting was called by the Local Board, and we were unanimous that the Bill should be opposed. The present Company and their predecessors have supplied our district since 1868. As to the quality of the gas—

Mr. RICHARDS, interposing, said he would take the opinion of the Committee as to whether witness was to be examined as to the quality of the gas, as there had not been one word previously on that point.

Mr. ROUND said he had asked the Chairman of the Company whether there had not been complaints as to the quality of the gas supplied.

Mr. RICHARDS said there had been 20 complaints in nine years, but his objection was that not one single question had been asked in cross-examination as to the quality of the gas.

The REFEREE inquired what allegation there was in the petition of the Board as to the quality of the gas.

Mr. RICHARDS: Not a syllable.

The REFEREE: It must be alleged in the petition whether the gas is bad, or whether the public are well or ill served, especially when a petition is made by a public body.



Mr. ROUND: Of course it is competent for me to go into the price, but can you consider whether the price is excessive or not without you consider incidentally the question of the quality. The price of 5s. may be very good for a certain quality of gas, or very excessive for a bad quality, and it appears to me that the questions of price and quality are so much mixed up together that you can hardly separate one from the other. I say that I object to have to pay 5s. 6d. per 1000 feet, as stated in my petition, when I can get supplied by the West Ham Company for 3s. 9d.

The CHAIRMAN observed that the quality would be determined by the Bill itself if it should pass, but the learned Counsel could not raise that point, as it was not mentioned in the petition.

Examination resumed: The Lea Bridge Company have not supplied us either with a satisfactory quality or proper quantity of gas, and it is undesirable we should be shut out for all time from the West Ham Company. We were not in any way parties to the agreement, but if Parliament once sanctions it, we shall be handed over to the Lea Bridge Company for ever, and that the Local Board of Walthamstow decidedly object to. We are quite content to let things remain as they are, and trust to the chapter of accidents whether the West Ham Company will not at some future time be willing to supply us. We should consider ourselves better off if supplied by them, even at an increase of price as compared with what they are charging some of their other consumers. We are prepared to pay a differential rate of 2d. or 3d. per 1000 feet, or something of that sort, as compared with the rest of the district.

Mr. ROUND: Looking at your present position as regards supply, would you—the Local Board—if you are not precluded, be disposed to have gas-works of your own?

Witness: That would require consideration. We should feel inclined, probably, either to have gas-works of our own, or to apply to some others to come into the district, which will be impossible if these gentlemen obtain parliamentary powers.

WEDNESDAY, APRIL 3.

Mr. Cuffley recalled, and cross examined by Mr. RICHARDS.

The Local Board of Walthamstow have been in existence for about four or five years, and, therefore, the Companies could not have gone behind the back of the Board when they made the agreement. We have no animus against the Lea Bridge Company; but we are bound to protect the parish from very much higher charges than our neighbours are paying. At the Vestry meeting, the terms of the resolution, that "Unless the promoters of the Lea Bridge Company's Bill assent to the standard rate of dividend being fixed at 6 instead of 10 per cent. per annum, and the standard price fixed at 4s. 6d. instead of 5s. 6d. per 1000 feet, or such term or terms as the Committee may approve of, this meeting is of opinion that the Bill should be opposed in Parliament." It would be unreasonable to ask the Committee to reject the preamble altogether if it be so altered as to be satisfactory to the parish with regard to the clauses. I cannot say how we propose to supply gas at a lower price. We could start a Company of our own, or there are other Companies who could be applied to for a supply, and who are quite as near as the West Ham Company. That Company have power to supply us; but they make an agreement by which they undertake not to exercise that power, and this places the parish in an unsatisfactory position. I cannot say whether we can compel the West Ham Company to supply our district.

Mr. RICHARDS: Supposing the population of West Ham to be 100,000, and the population of Walthamstow 12,000, and supposing the standard price at West Ham to be 4s. 6d., do you think 5s. would be an unfair price for so comparatively small a concern as the Lea Bridge Company?

Witness: I should say 5s., with a standard dividend of 10 per cent., would be most onerous, and would bring our price to double what the West Ham Company are charging their customers.

Ten per cent. is upon the old capital only. Do you think it possible to supply a small district like Walthamstow, consisting of something under 20,000 people, on the same terms on which you can supply a concentrated population, like that of West Ham, of 100,000?—I think the Company would be entitled to some little increase.

Re-examined by Mr. ROUND: Mr. Richards has taken 4s. 6d. as the price at West Ham; but the fact is they are charging 3s. 9d., with the possibility of its being reduced to 3s. 6d., and in that case the disparity would be all the greater. To some extent it might be an advantage to be supplied by a Company under Parliamentary restrictions; but those advantages are not sufficiently great for us to wish to see this Bill passed with so high a price as 5s., and with the standard they propose as to dividends. The inhabitants of Walthamstow were not consulted in any way with reference to the agreement, and, therefore, it was made behind their backs, and no doubt the Companies considered it a good stroke of business. If the Bill is thrown out we could apply for power to supply ourselves, although there is no doubt the West Ham Company would oppose any other body than the Lea Bridge Company applying for statutory powers.

By the REFEREE: We complain of insufficient quantity, inferior quality, and a higher price than has been charged in the neighbouring districts.

Mr. RICHARDS said those charges were positively untrue, and he trusted he might be permitted to recall the Engineer to rebut them.

Mr. James Higham, examined by Mr. ROUND.

I have resided at Walthamstow for 20 years, and am more largely interested in house property there than any other person in the parish. I have taken part in all public meetings in Walthamstow during the time I have resided there. I have built about 50 houses near the church, averaging in value from £700 to £1200 each, nearly all of which are sold to gentlemen who occupy them, and who go backwards and forwards to London daily. I have had opportunities of hearing their opinion, which is one general complaint of the gas supplied by the Lea Bridge Gas Company. I have been the best friend to the Company in the parish, inasmuch as I have in each case laid the gas on all over the house; but in two or three cases the parties are so dissatisfied that they will not use it. At the same time I have increased the rent-roll of the Company more than any other person. A gentleman who paid them £24 a year was so dissatisfied that he—

The CHAIRMAN: That is not alleged in your petition, and you are, therefore, precluded from entering into that matter.

Examination resumed: The population of the parish of Walthamstow in 1851 was 4700; in 1856—at the time the West Ham Company obtained their power to supply the parish—it was 5400; in 1861 it increased to 7100; in 1871 it was 11,000 odd; and, certainly, it is largely on the increase now. We have four railway stations in the parish, and the station-master at Hoe Street told me they issue 560 season tickets annually, besides from 250 to 300 weekly tickets. All round Hoe Street station there are literally hundreds of sites ripe for building purposes, and I am speaking within bounds when I say that the population of the parish will be nearly trebled in the next 20 years. We are only seven miles from the City, and we are the first outlying district where there are large plots of land which can be built upon. Each year, as the population increases, it becomes a more attractive district for a Gas Company to supply, but the consumption would increase to a much larger extent if we were supplied by the West Ham Company. They are within about half a mile of Waltham-

stow at one point—viz., at Park Place [pointing it out on the map]. They also supply a mile and a half beyond it—viz., at Woodford—at 8s. 9d. per 1000 feet. The allegations in the petition presented in 1873 were about the same as those in the present petition, and it appears to me that there is no reason why Parliament should sanction this proposal now when they refused it in 1873. Just before the Committee met in 1873, I went with the Chairman of our then Local Authority, the Highway Board, to the Deputy-Chairman of the West Ham Company to ask him about the agreement, and he said they knew very little about it at the Board; that they had plenty of consumption for their gas, and did not care much about the outlying districts; and we believe we were handed over by some arrangement made in that way. Speaking on behalf of a considerable number of the inhabitants, we say that the Bill ought to be thrown out; but, supposing the Committee should think that the Bill must be passed, then we ought to be placed upon something like terms, so that we could get a supply from the West Ham Company. Woodford and Snarbrook only pay 3s. 9d., and they have an equally sparsely populated district. I think we could induce the parish to pay an extra 9d. per 1000 feet to West Ham, (because they might have to lay some larger mains) and that would put us at 4s. 6d. I have had some little experience in Committees, and I say that the agreement is a violation of an arrangement with Parliament. The West Ham Company ought either to apply to Parliament to be relieved from their power of supply, or they ought to exercise it, and not not be a dog in the manger. In their notice, the Lea Bridge Company state that the object is to confer upon the Company the necessary powers and authorities for the supply of gas, and for all purposes, and to the exclusion of any other Company now authorized to supply gas within the district, and, therefore, the object is to shut anybody else out. I also submit that the idea of fixing the standard dividend at 10 per cent. may be very well for the Metropolis, but it is quite out of the question in a district like this. It is unreasonable to suppose, especially with the prejudice there is against the Lea Bridge Company, that the Company could increase their dividends materially, because to do so they must lay out further capital. As to the lighting arrangements, we are obliged to have our lamps in many cases more than half as far again apart as they should be for the public safety, on account of the objection on the part of the parish to the charges for gas supply. The Committee will also observe that, under the present Bill, it is not stated that the extra capital is not to receive 10 per cent. dividend, and, unless 4s. 6d. is made the maximum charge—their dividend being only 6 per cent.—they could immediately raise the price by 1s. 4d. I know it would be suicidal, but that is the working of the clause. They could raise the price to 6s. 10d. per 1000 feet. We certainly should not get a reduction in the price from 5s. within 15 years.

Cross-examined by Mr. RICHARDS: I say that 10 per cent. is very well for a Metropolitan supply, but not for Walthamstow, because they have to carry a main in some cases along a road, and only, perhaps, supply three or four houses.

Mr. RICHARDS: If Walthamstow, as you seem to anticipate, develops tolerably rapidly, that would hardly be the case, would it?

Witness: Yes, it would; because, although I have put gas in my houses, that is not an example which has been followed by others. The estates are being cut up and sold to make the most of them, and the people who will inhabit those houses are a class who will not have the gas laid on. Our public lighting would, however, increase materially.

For private purposes Walthamstow is not so rapidly increasing a place as you seem to think?—Certainly not, while the present Company supply them. It would increase much more largely if the West Ham Company supplied them.

The CHAIRMAN: Before going further, I should like to know what is the position of the inhabitants on the white portion of the map. Have they ever been served by the West Ham Company, and at what price?

Mr. RICHARDS said they never had been served by the West Ham Company, and that Company were under an agreement now not to serve them.

Sir. M. WELLS, on behalf of the Leyton Local Board, said the case of that Board was entirely distinct from that of Walthamstow. At the outset, he wished the Committee to understand that they were called upon to repeal the West Ham Company's Act, and to reverse the decision of Parliament in 1873, and he had to ask them upon what grounds they were prepared to reverse that decision. If the Committee would refer to the Bill of 1873, they would see that the agreement mentioned in that Bill was precisely the same as that incorporated in the present Bill, and he asked, upon what evidence were they now to decide that an agreement should be sanctioned, which would have the effect of doing away altogether with the parliamentary power of the West Ham Company in the district which he represented? Not only the Local Board of Leyton, but an overwhelming majority of the whole parish, determined to oppose the Bill, though most of them were paying only 8s. 9d. per 1000 feet for gas. They felt the injustice to the other portion of the parish, and when the question came before them decided by something like 900 to 300 that the Bill ought to be opposed by the Local Board, representing the entire parish and district. With regard to the price, it must be remembered that the Company were at present without parliamentary powers, but the moment they were incorporated and had a parliamentary status their property became more valuable, and they were in a totally different position in every respect from what they were at present; and therefore the Committee would see beyond all doubt that 5s. was not the sum which should be inserted in the Bill. Under the West Ham Company's Act of 1856, the whole district was included, and it was rather a strong measure for a party to obtain parliamentary powers and then, behind the backs of the public, to enter into an agreement to get rid of the liability to supply gas to a portion of that public. The mains of the West Ham Company were on the very edge of the Leyton district, and why should the latter pay for 20 years, say, 4s. 6d. or 5s. per 1000 feet for gas because it might cost more money to supply such a district as Walthamstow? Why did Parliament in 1873 refuse to pass the Bill, except that there was no ground whatever for releasing the West Ham Company? It was not a question of competition, but it was a question of parliamentary powers being given over a district; and then the Committee had to see what additional reasons existed now than those which existed in 1873. Taking the evidence of the Chairman of the Lea Bridge Company, and the Engineer of the West Ham Company, there was not one word from beginning to end pointing out any reason why the Leyton district should be free from the West Ham Act, or why the West Ham Company should be free from the liability of supplying that district with gas. The promoters had called the Chairman of the Company, who said that under certain circumstances he would take less than 5s. They had called an expert, Mr. Penny, a very able Gas Engineer, who was called on one side or other on most Bills, and they had called their own Engineer. They had not, however, called the Manager of the works, but he (Sir M. Wells) did not much care about that, because the question of the quality of the gas would not be gone into, in consequence of the petition not containing any allegation about it. He must, however, say that they ought to have called some of the inhabitants, to show that the powers



they were seeking should be granted, and that the price proposed was reasonable. They might have called the Chairman of the West Ham Company; but there was not a single person, except the Engineer, who represented the policy of the Company, and the Committee could not rely upon that evidence. The Committee were thus asked to reverse the decision of the Committee of 1873 upon the testimony of the Chairman of one Company, the Engineer of another Company, and an expert—Mr. Penny. It was well known that when a Local Board wished to oppose a Bill they were bound to take the votes of the inhabitants, and accordingly a meeting was held on the 13th of February, at which a resolution to that effect was carried. According to the declaration of the returning officer, the result was as follows:—"In favour of the adoption of the resolution, 999 votes; against, 993; majority in favour of the resolution, 646 votes." Considering there was no interest on the part of those gentlemen in reference to their own gas, and considering they had to pay the expenses of the opposition, that was a strong expression of public opinion. Complaint had been made that it was not a district which ought properly, legitimately, and fairly to be lighted by the West Ham Company, but they might have said that it was a district so expensive to light that, under the circumstances, it was better to have nothing to do with it. No evidence had been given to show that it was not a district which might fairly be lighted by the West Ham Company. The Walthamstow people objected to the gas-works, and the Leyton people thought it a very hard thing that they should have the gas-works in their parish to supply Walthamstow, because the mains of the West Ham Company were already laid down, and there was no question about the expense. The consequence of the passing of the Bill would be that for 20 years the inhabitants of Leyton would have to contribute substantially towards the works in the larger district of Walthamstow. When they were dealing with the question of the *bona fides* of the parties, it was clear that they were doing just what they thought proper in their own interests, quite apart from the question of how it might affect the public. Supposing the Committee should be of opinion that the boundary should be as proposed, there was nothing to prevent them giving to the parish of Leyton the price of 3s. 9d., because it must not be supposed that, although the maximum was 4s. 6d., if ever they applied to Parliament again they would get more than 3s. 6d. When the London Companies, who had been charging 4s. and 4s. 6d. went before Mr. Forster's Committee almost pleading poverty, the Committee decided that 3s. 9d. should be the standard price; and he (Sir M. Wells) hoped the Committee would not inflict on his clients a higher price than 3s. 9d. if they thought the works ought to remain in the district, although he did not think it would be to the interest of the public that they should so remain. The principle of the sliding scale was a very dangerous one, and was almost wholly in favour of the Companies, and that they knew. It was not desirable to place the Company upon a sliding scale which would enable them to charge 6s. 4d.; but if there were to be a charge, say, of 4s., with power to the Company to lower their rates, the arrangement would be a fairer one for the Company and a more beneficial one for the public. It might be asked, "Is not that one-sided?" for the Company would never lower their rates unless it was for the purpose of increasing their business. Supposing they had the power to charge a maximum of 4s., if they could, by charging 3s., quadruple their business, they would do it, and therefore a descending scale was a fair one, but a scale which enabled a Company to raise the price for the purpose of securing a standard dividend of 10 per cent. was utterly unjust. There was another clause in the Bill to which the attention of the Referee ought to be specially directed—viz., the reserve-fund clause, which made it perfectly absurd to talk about ever lowering the price of gas. That clause enabled them to put by a large sum of money for certain purposes in reference to future years; so that in point of fact the sliding scale would scarcely ever come into operation in such a district. In conclusion, he (Sir M. Wells) asked the Committee to withdraw the agreement from the Bill, but if it was thought desirable that the Company should remain in the district, then he hoped a price would be given which would be just, considering the position and the circumstances of the district which he represented.

Mr. George Chew, examined by Sir M. WELLS.

I have resided for 17 years in Grange Park Road, Leyton, in the West Ham district, and for three years have been a member of the Leyton Local Board. I have read the clauses of the proposed Bill, and oppose them simply on public grounds, representing, as I consider, the interests of the general body of parishioners. There is plenty of ground in the Walthamstow district on which gas-works could be built; in Walthamstow Marsh, for instance, there is ample space. I consider the extension of the gas-works in the parish of Leyton will be prejudicial to the interests of the public. There are some valuable houses within a short distance of the site, and it would be especially detrimental, looking forward to an increased erection of buildings. The houses in the neighbourhood let at about £100 a year. I am aware that the West Ham Company are seeking to free themselves from their liability to supply Leyton, but, at the same time, they are supplying places farther off. The operation of the Bill, if it passes, will be that my neighbours will have to pay considerably more than I do, though living close by. The price charged for the public lamps by the Lea Bridge Company is £5 18s., and by the West Ham Company £5 7s. 6d. There are 66 public lights supplied by the Lea Bridge Company, and 166 supplied by the West Ham Company. I am of opinion that, in the interests of the public, the sliding scale, which enables the Company to raise the price, on a maximum such as 5s. 6d., is unjust; but I consider that a descending scale, which gives an option to the Company, if they think proper to reduce the charge, is fair and just between the two parties.

Sir M. WELLS: If the Company, by reducing the price, can increase their business, they will do so?

Witness: No doubt. Perhaps I may make this suggestion: The Bill says the dividend to be "declared" shall be 10 per cent. It should not be "declared," but it should be 10 per cent. upon the profits, and for this reason, that the profits are not always divided, and the Company instead of dividing will go on increasing their stock, and lay out their profits for that purpose, and therefore the consumers will never arrive at the benefit of a reduction under the 10 per cent. clause.

Cross-examined by Mr. RICHARDS: I admit that the West Ham Company could not supply the Lea Bridge district without a breach of agreement, but I say that the third party—the most interested—was excluded from all concert in that agreement.

Mr. RICHARDS: Has any application ever been made to the West Ham Company to light the district now supplied by the Lea Bridge Company?

Witness: I do not know that there has been; but when we are shown an agreement that is binding between the two, we do not wish to force these people into a breach of covenant; but, at the same time, we feel the gross iniquity of the thing all the same.

Notwithstanding the "gross iniquity"—which is a strongish phrase—the result was that you obtained gas from the Lea Bridge Gas Company a good many years earlier than you would have done from the West Ham Company?—No; I do not admit that.

Mr. James Gallagher, examined by Sir M. WELLS.

I agree with the evidence given by the last witness, and come here on public grounds in reference to this Bill.

Mr. RICHARDS: Do you call it a "gross iniquity," too?

Witness: If you put it that way, I call it a gross iniquity that, two or three yards from my own door they should be compelled to pay 5s. 6d., while I pay 3s. 9d. We said, "As a neighbourly action, we cannot allow this Company to come in here;" so the whole parish were of opinion the Bill should be opposed. The only question was that a small knot got up an opposition, saying it would cost £3000 or £4000, but on the parish being polled, the opposition was decided upon by a large majority.

Sir M. WELLS said he had some other witnesses in attendance, but as there was no cross-examination, he would not waste the time of the Committee by producing them. He would only call one witness to give formal evidence with respect to the poll of the parish.

Mr. Robert Thomas Wragg, examined by Sir M. WELLS.

I am Solicitor to the Local Board. The numbers read over to the Committee are correct. We object to the Bill because we think there is sufficient ground in Walthamstow upon which they could erect works; at all events, we argue that if they place the extended works in Leyton, they should give us the same terms that the West Ham Company do.

Sir M. WELLS said that was his case.

Mr. RICHARDS, in replying upon the whole case, said that language had been used which, he could not help thinking, was somewhat discreditable. The agreement between the Companies had been spoken of as a piece of "gross iniquity." Nothing was gained by using that sort of language, and it was extremely unfair to apply such remarks to the gentlemen who had the conduct of those two Companies. The facts of the case were that the West Ham Company, having been established a certain number of years, found it did not answer their purpose to go into the thinly populated district included in their parliamentary area under the Act of 1856, and they entered into an agreement with the Lea Bridge Company, by which they agreed not to supply a certain district which they themselves felt they could not light, and they allowed the Lea Bridge Company to take the district. The Committee might be reminded that the West Ham Company would never have gone to that district for years and years, and the inhabitants would have been without gas if it had not been for the action of the Lea Bridge Company, and the return they received for that action had been seen from the manner in which they had been spoken of by the witnesses who had been examined. The cutting off a district in that manner was not a new idea; in fact, Mr. Penny had mentioned several instances. The arrangement which had been made was for the benefit of the inhabitants, who otherwise would have had to go without gas, because there was no means of compelling the West Ham Company to supply them. By the Act of 1871 a Local Board could compel a Company to light within 50 yards of their mains; but no Company could be expected to carry a main for the sake of supplying a single light at every 100 yards. The Committee would see that if a Local Board had power to compel a Gas Company to carry their mains over an agricultural district, it would be an absurdity. The West Ham Company had said it would cost them £10,000 to go into the district, and they had deliberately come to the conclusion not to incur the expense. Another point was, Why did the present Bill, which was rejected in 1873, come before Parliament again? It was because the West Ham Company, after mature deliberation during the last five years, had come to the determination to abide by the agreement. They said it would not pay, and, therefore, they had abandoned that part of the district.

Sir M. WELLS: As to its not paying them to light it, that applied to Walthamstow. The witnesses did not say it would not pay to light Leyton.

Mr. RICHARDS said his witnesses spoke of both districts. There was, however, the fact that the West Ham Company had deliberately entered into an agreement not to go into that part of Leyton. Could it be for any other reason than that they found it did not pay? The Lea Bridge Company came before the Committee asking for incorporation, and for the confirmation of the agreement, and the West Ham Company asked for an Act to abandon part of the district which they had handed over to the former Company because it would not pay to go into it. His learned friend urged that the agreement should not be confirmed; but it was equally binding upon both parties. The Engineer of the West Ham Company said that it would cost the Company £10,000 to go into the district; but there was one very material feature—the West Ham Company acted upon a sort of sliding scale, and charging 3s. 9d. they could a pay 10 per cent. dividend; but if they were compelled to charge more than 3s. 9d., then under their Act they could not pay so much, but had to go on a lower scale. The object, therefore, of the West Ham Company was clearly to keep their supply in the most condensed district possible, and they were anxious to get rid of what at one time they regarded as a privilege—viz., the power of lighting Leyton—and the way they did it was by handing over the agreement to the Lea Bridge Company. His learned friend had said his object was not to throw out the Bill altogether, and what reason could they have in doing so? The agreement, if confirmed, would be extremely useful; but if it were not confirmed, it would still subsist as binding between the two Companies, and it appeared there was enough before the Committee to enable them to say that the West Ham district was larger than the West Ham Company required, and that the true interest of the public was to have a separate Company supplying the portion of that district which the Lea Bridge Company supplied at present. A phrase had been used that the agreement was made behind the back of the public; but who were the public? There were no Local Board to communicate with in 1868, and, therefore, that was a wrong phrase to use.

Sir M. WELLS said there were a Highway Board and a Lighting Board.

Mr. RICHARDS said that was true, and it was also the case that neither the one nor the other was consulted; but, if they had gone to either of those Boards, they would have been thankful to get gas at any price, because they would have known they had not a chance of obtaining it from the West Ham Gas Company, and they must have felt that neither the Lea Bridge Company nor any other Company would enter the district unless they had the security that the West Ham Company would not exercise their parliamentary rights over the district that the Lea Bridge Company had taken possession of for the benefit of the inhabitants. Now, however, the public turned round, and talked of what the Company had done as an act of gross iniquity. With regard to price, the sum of 5s. had throughout the case been most unfairly compared with 3s. 9d., whereas the proper comparison would have been between 5s. and 4s. 6d. The former was the standard price proposed by the promoters, and 4s. 6d. was the standard price of the West Ham Company, although by successful working, and by the development of the district, the operation of the sliding scale had been such that the latter Company had come down from their standard price to 3s. 9d. If the Lea Bridge Company went on prosperously, and their district developed, they would come down in the same way. The Committee had before them the actual dividend the Company had been able to pay, and the actual profits they had made. They had never divided more than 6 per cent., and had put by on an average £250 a year, which was less than 1 per cent. on their capital of £35,000. Was that an unreasonable return for money invested in a commercial speculation, and could it be believed that people would accept a Bill which was to give them less than 5 per cent. for their money, which was less than they



would obtain in the ordinary operations of trade? Persons who had watched the fluctuations in the gas market knew that the price of gas shares had of late years been subject to the most tremendous fluctuations in consequence of the apprehensions which were felt with regard to the electric light, and, therefore, the dividend of 6 per cent. which the Company had earned was not an unreasonable return for their capital. Considering the way in which the concession had been received, it was to be regretted that the Company had made the reduction from 5s. 6d. to 5s., but the instant that 6d. was conceded it was made a standpoint for trying to squeeze them harder. Was it reasonable to suppose people could afford to take a price less than that which would pay them 5 per cent.? On one side there was a population of 100,000 or 120,000, while on the other there was only 18,000 or 20,000, and was it reasonable to believe that if 4s. 6d. was a fair standard price for a thickly populated district, 5s. was not a fair and reasonable price for a thinly populated district?

Sir M. WELLS said that if the West Ham Company applied to Parliament at present their standard price would not be 4s. 6d.

Mr. RICHARDS said there was not the slightest reason to suppose it would be otherwise, for what his learned friend stated about the Metropolis Gas Act had nothing to do with it, and was not worth disputing; but the very fact of the West Ham Company having originally 4s. 6d. as a standard price was a strong argument for the Lea Bridge Company having 5s. Looking at all the circumstances, he thought the Committee would say that 6s. was a reasonable price, and he also thought he had shown reasons why the confirmation of the agreement would not affect its existence. It was well known that the whole principle of gas legislation for the last 20 years had been most distinctly to discountenance competition in gas supply, but at the same time the Companies were placed under strict parliamentary regulations. The Committee would be doing a great kindness to the inhabitants by agreeing to what both the Lea Bridge Company and the West Ham Company asked them to do—viz., to confirm the agreement, and to say that the standard price might fairly be placed at the reduced price of 5s.

The Committee-room was then cleared. After some time the Counsel and parties were called in.

The CHAIRMAN said the Committee had found the preamble of the Bill proved, and they had accepted the price of 5s.

The clauses were then proceeded with. On clause 21,

Mr. PAINE (in the absence of Mr. Round) said his clients considered the proposed increase of capital to be excessive. There had been no evidence produced to show the necessity for it, and they considered it would prejudice them, as there would be a larger capital to pay statutory dividends upon than was required; and no evidence had been given as to what the new capital was to be expended on.

Mr. RICHARDS said it was a capital which would last for twelve years, and upon that point not one single word had been asked in cross-examination, which showed that the petitioners did not attach real importance to the question. The premiums did not go into the pockets of the Shareholders, and the Directors had no earthly object in issuing a shilling of capital that was not strictly required; but Mr. Paddon said it was required.

The CHAIRMAN (to Mr. Paine): Do you suggest a lower sum?

Mr. PAINE: I am afraid I must give way upon that point.

Upon clause 43,

Mr. PAINE asked to make the dividend of 7 per cent. applicable to the whole of the capital; or, if the Committee thought that unreasonable, that it might be  $7\frac{1}{2}$  per cent., with a standard price of 5s.

Mr. RICHARDS said that was the first time such a proposition had ever been made, because the Company had a statutory right to divide 10 per cent. at present.

Mr. PAINE said it was not a statutory right.

Mr. RICHARDS said that, as a rule, where they had a sliding scale, it carried with it the possibility of making 10 per cent. upon the whole capital. He thought a great concession had been made when it was proposed to limit the 10 per cent. to the old capital, and take 7 per cent. only upon the new.

Mr. PAINE said that was not giving anything, because 7 per cent. was the standard dividend allowed upon new capital.

Mr. RICHARDS: But you are seeking to alter the dividend upon the old capital.

The CHAIRMAN: I think the principle which Parliament has laid down is that the original capital should bear 10 per cent., unless there are exceptional circumstances.

On clause 60, referring to the notice to be given with regard to the testing of the gas,

Mr. PAINE proposed the words "two hours" instead of "sufficient."

Mr. RICHARDS said it might be more convenient there should be a specified time, and suggested "three hours," which was agreed to.

The remaining clauses were also agreed to, and the Chairman was directed to report the Bill to the House.

MONDAY, MARCH 11.

(Before the Marquis of LORNE, Chairman; Mr. STARKEY, and Mr. ERNEST NOEL; Sir JOHN DUCKWORTH, Referee.)

CHELtenham WATER BILL.

CHELtenham CORPORATION WATER BILL.

(Continued from p. 640.)

Mr. Edward Leader Williams, examined by Mr. BALFOUR-BROWNE.

I am a Member of the Institution of Civil Engineers, Engineer to the Severn Commission, and was formerly Surveyor of the city of Worcester and had the superintendence of works for supplying Worcester with water. I have been professionally engaged on the Severn navigation upwards of 40 years. The whole of the works for the improvement of the river, for the last 20 years, have been under my supervision. My private residence is on the banks of the river, above the outfall of the main sewer at Worcester. I certainly do not consider the Worcester water pure and fit for the supply of a town. I consider that a large population should never be supplied from a navigable river. A river is a main drain of a district, and, consequently, to a certain extent the main sewer. There is naturally a great deal of bad matter washed into the river from the surface of the land, and therefore I hold that it is against the operations of nature that water for the supply of large populations should be taken from a river. After heavy rains the Severn is charged with a considerable amount of earthy matter. At flood time I have seen one side of the river, opposite the main sewer, the colour of varnished oak, and the water on the main sewer side the colour of ink. The water is sometimes so foul that it would readily clog the filters. I never allow my family to drink it. It varies very much as to hardness. The watershed of the river above Tewkesbury is about 6000 square miles, with a town population of 250,000 or 270,000. There is, besides, a large country population resident on the watershed. I include in this estimate half the population of Dudley. Ellesmere, in Shropshire, has the smallest population of any town I have taken. The Droitwich Canal is also a means of getting rid of sewage. No filtration can get rid of gases which arise from putrid animal matter. On one occasion, some distance below Tewkesbury, the tide was running down so

rapidly that my steam launch hardly made any headway against it. It was charged with filth by wholesale. The Fishery Association have been exceedingly anxious to ascertain how far the tide flows up the Severn, and I have found that it flows up to seven miles below Worcester, on the top of the spring. It then brings up the sewage that has been flowing down. In 1870 the tide overflowed Tewkesbury Weir 31 days; in 1871, 31 days; in 1872, 34 days; in 1873, 22 days; in 1874, 19 days; in 1875, 21 days; in 1876, 26 days; in 1877, 32 days. It sometimes overflows the weir in summer as well as in winter. It is the constant practice for barges to go over the weir. I have known trains of vessels half a mile long sailing over the Weir. I bring my water from Malvern rather than drink the filtered water supplied by the Corporation of Worcester.

In reply to Sir John Duckworth,

Mr. BALFOUR-BROWNE said part of the Corporation scheme was to take over the part of the Company's concern at Tewkesbury.

Cross-examined by Mr. VENABLES: Earthy matter can be entirely got rid of by subsidence and proper filtration. When a filter-bed gets choked, the ordinary course is to leave off using it for a time, and use another. I cannot recognize the specimens shown to the Committee as Severn water at all. I do not like the spring water about Worcester. There may be some good springs there, but I do not happen to know them. The spring that supplies my pump is not at all what it ought to be; and therefore I prefer paying 4s. per dozen quarts for Malvern water than drink the Worcester water. Some years ago I reported to the Worcester Corporation in favour of a scheme for getting water from the hills, but the Corporation decided against me. I am free to confess that the supply of the Severn water to Worcester is a very great boon as far as watering gardens, &c., is concerned. My evidence goes against the use of river water at all for drinking. I think even the Thames water is totally unfit for London. The Teme is better water than the Severn, but still it is not fit for drinking. I think it is impossible by chemical analysis to discover all the gases that are produced by decomposed animal matter. I have heard chemists so disagree about the analyses, that I consider the whole matter is *in nubibus*. The weir at Gloucester has had an effect on the flow of mud and refuse up the stream. The whole of the upper Severn is clear from any deposit of mud, while previous to the construction of that weir the whole channel of the river was silted up, and by this time there would have been no water communication to Gloucester at all if those works had not been erected.

Mr. J. H. Long, Inspector of Nuisances for the borough of Cheltenham, said on the 8th of February last he went to Upton. He took a boat on the river and went past the town, and, going close along the banks found a great many drains running in from private houses, and closet soil oozing out. He was informed that all the houses drained into the Severn, with the exception of some eight or twelve houses, which drained into a ditch.

Cross-examined: There was a Local Board at Upton.

Mr. George Edmund Hide, F.R.C.P., M.R.C.S., said he was a surgeon, in general practice at Worcester. He was Medical Officer of Health for the district of Martley. He had devoted much attention to water supply and sanitary matters. There were in Worcester a considerable number of cesspits and dumb wells. Those wells had been largely contaminated, and were closed by the Town Council. Owing to that circumstance, the Severn water was the only water that a large number of the inhabitants could use. All who could afford a filter used one. The poor, who could not afford a filter, did not like to drink Severn water, and would often beg well water from those who had it. He was obliged to use Severn water, but did not allow his children to drink it unless it had been boiled. In summer it was not fit to drink. It was not always of a good colour, but sometimes after a freshet was brown and turbid. That colour was not always discharged by filtration. It sometimes had an offensive smell, owing to decomposing animal matter. There was more than an average amount of diarrhoea in Worcester, and new comers were especially subject to it. He believed in summer the water was one of the causes. From the Registrar-General's returns, from 1851 to 1861 the mean population of Worcester was 29,322. During that period the deaths from typhus or typhoid were 202, or a death-rate of 6.89 per 1000; from 1861 to 1870 the population was 31,693, deaths from typhus and typhoid 274, or a death-rate of 8.64. Deaths from diarrhoea, dysentery, and cholera, from 1851 to 1860, 353, or 12.04 per 1000; from 1861 to 1870, 494, or 15.58. The total death-rate from all these diseases in the first ten years was 555, or 18.90 per 1000; and from 1861 to 1870, 768, or 24.33 per 1000. The death-rate resulting from these diseases in Worcester was about twice as great as in Cheltenham. In the prison at Worcester, where they used well water, they had not had a case of typhoid during the 13 years he had been connected with it. The cases of diarrhoea were few, and there had been no deaths. He had analyzed the water three or four times. Chemical analysis by itself was not a perfectly satisfactory guide in judging whether water was or was not fit for drinking purposes. The fact that large quantities of sewage were known to be in the water would, in his opinion, render it unfit for drinking purposes.

Cross-examined by Mr. VENABLES: He did not agree with Dr. Odling and Dr. Tidy that the water was quite as good two or three miles below Worcester as above. No doubt a great many cases of typhoid were due to sewer gas. Of the remainder, some might come from contaminated well water. Cheltenham was a town containing more well-to-do people than Worcester, and where, no doubt, the appliances of health were more available. There had been no cholera at Worcester of late years. Very likely 6-17ths of the people took the Corporation water. At this time of the year it was very fair water, but in summer it was objectionable. Colouring matter in water resulting from peat was perfectly harmless.

Re-examined by Mr. BALFOUR-BROWNE: Chemical analysis could not distinguish the excreta of typhoid or cholera patients from that of healthy persons.

By the CHAIRMAN: At the Infirmary the Severn water is not boiled before being given to the patients.

Mr. Edward John Gibson said he was a surgeon practising at Worcester. The only water supply in his house was from the Severn, but it was never used for drinking until it was filtered. The filters become clogged occasionally. The water, as supplied to him, was badly coloured. To drink it from the tap would be dangerous to health. His own assistant had an attack of typhoid fever, which was attributed to his drinking the tap water, which he had been warned against.

Mr. NOEL: Your objection to the Worcester water is because it is not filtered. You are content with it when it is filtered?

Witness: I am obliged to be content with it, because I have no other water on my premises. Even after I have filtered it, if it is allowed to stand for some considerable time, it becomes offensive.

Mr. Thomas Minshall, a member of the Town Council of Worcester for 30 years, said he was opposed to the original introduction of Severn water, because he had been previously acquainted with its impurities, and considered it unfit for drinking purposes. It was sometimes thick and turbid, and after being kept for a little time, it covered itself with a film. He owned a good deal of house property in Worcester, and found that his tenants had a repugnance to using it. The inhabitants of Worcester would not drink the Severn water if they were not compelled to do so.

Mr. A. W. Knott, a solicitor at Worcester, said he knew of no case in that



town where the Severn water was used for drinking purposes without being previously filtered. Poor people who could not filter it, boiled it; and there was general dissatisfaction with it.

Rev. H. Kynaston, the principal of Cheltenham College, said he should certainly disapprove of the Severn supply for the town. He had been on the river at Tewkesbury, and seen how dirty it was. The feeling in Cheltenham was strong against the scheme. If the supply was transferred to the Corporation, he would have confidence in their management. He thought it very important that the supply should be in the hands of the public body. He would not like his boys to drink the Severn water, as their healths might be affected.

Dr. Morley Rooke, a physician practising in Cheltenham, said he was against the introduction of Severn water into Cheltenham. There was a very strong feeling in the town against its introduction, as far as he had been able to test it. If it were to be introduced, it would be a very serious injury to the reputation of the town, and, consequently, its prosperity, and it would be an actual injury in the possibility of conveying disease. During the last epidemic, cholera was prevalent in most of the towns on the Severn bank. Cases occurred at Tewkesbury and Gloucester, also at Upton. There was not one case in Cheltenham; but he doubted if a like clean bill of health could have been presented if Severn water had been supplied. There was a strong suspicion that cholera followed the course of rivers, and that water was a carrier of disease. He did not believe the ordinary filtration which Companies gave would make the Severn water a good potable water.

Mr. VENABLES: During some years, when the smell of the Thames was perfectly intolerable in these rooms, was it not clear that no disease was traceable to it except people were foolish enough to drink it?

Witness: I mean if the germs are present in the atmosphere, the river acts as a conveyor.

Mr. Brook Smith, one of the masters of Cheltenham College, said he had under his charge one of the large College houses, with nearly sixty boys. He was deeply interested in the question of water supply. He thought the supply should be in the hands of the Corporation, because they would study the general benefit of the town, and would not take the question of dividends into consideration. In 1865 he remembered the feeling excited by the proposal to introduce Severn water; it was exceedingly strong then, and was as strong now. Hearing that there was a possibility of getting pure water, he would prefer the Corporation scheme to that of the Company. Before 1865 he paid £8 8s. a year, but after 1865 his water-rate was increased to £20 16s. His premises were enlarged, but the consumption, on the whole, was rather less. Any further raising of the rates would be very prejudicial to the town.

Cross-examined by Sir E. BECKETT: He could not say how the Corporation were to be able to supply water more cheaply than the Company. He knew nothing whatever about the Severn water; he simply would not drink water through which sewage had passed.

#### TUESDAY, MARCH 12.

Dr. W. Thursfield said he was Vice-President of the Birmingham and Midland Society of Medical Officers of Health, and the author of several works on sanitary matters. He was also Medical Officer of Health for a district round Shrewsbury, with a population of 200,000, and containing 21 sanitary authorities. Shrewsbury, Ludlow, and Much Wenlock were in this district. He had paid much attention to the question of water supply in relation to health, and considered the use of river water, impregnated with sewage, improper and dangerous, and opposed to precision in the use of medicine. Severn water was used at Shrewsbury, but he had warned the people against using it for drinking purposes. The population of Ludlow on the Teme, a tributary of the Severn, did not use the water for drinking, and were proposing to go to the hills for a supply. He did not consider the Severn at Tewkesbury a fit water for drinking purposes.

Cross-examined: By contaminated water, I mean water contaminated by human excreta. No water that has been thus contaminated is safe for drinking purposes, and no distance of flow removes the danger, though it may lessen it. The effect will continue for 100 miles. I have seen cases of typhoid fever caused by drinking Severn water, but at what point the infecting excreta was received into the river I cannot say. I do not believe in well water in towns, and, as a rule, would prefer Severn water.

Re-examined by Mr. BROWNE: Typhoid at that time did exist above, at other places. He believed that the excreta of a typhoid patient might contaminate water without its being liable to discovery by analysis. In his experience he had known the excreta from a typhoid patient thrown into a large body of water, and, percolating several yards through the soil, it specifically affected a well, and typhoid fever picked out the persons who used the well. No analysis of the water was taken that he knew of, but analysis would not have detected the presence of the poison. He knew this, though no analysis was taken.

Mr. J. Watton, a surgeon and magistrate of Shrewsbury, member of the Town Council and of the Severn Board of Conservators, said the Severn flowed past the end of his garden, and he had daily acquaintance with it as a boating man and an angler. The question of water supply had been long under consideration by the Shrewsbury Town Council. The Corporation had purchased the works, and were making inquiries with a view to the abandonment of the Severn as a source of supply for drinking, and going to the Stretton Hills. Some years ago Dr. Farr, the Registrar-General, attended the Town Council, and made a report as to the water supply, which was published in the Registrar-General's report. He knew that typhoid had occurred at the prison, and that there the Severn water was laid on. In one specific case the surgeon attributed the attack to the drinking of the Severn water. In 1853, Mr. Rainger was sent down by the Board of Trade, and condemned the Severn water. He knew the town of Bridgnorth, below Shrewsbury. The people did not drink the water, and notices were issued by the Town Council cautioning against the use of the water. He produced copies of this notice. As one of the Board of Conservators he knew that attention had been called last year to the pollution of the river, and even above Shrewsbury the river was very filthy. In a run down to Worcester, on the 2nd inst., he counted not less than 40 dead animals.

Mr. BROWNE: Do you think the Severn at Tewkesbury a fit source of supply for Cheltenham?

Witness: Certainly not. I believe its introduction would be the ruin of the town, if it became known that the town took its water from the Severn. At present Cheltenham is the healthiest town in England, whereas Worcester, which is upon the Severn, has a much higher death-rate.

Cross-examined: I know that the Shrewsbury death-rate is very high, and that Cheltenham is the healthiest town in the kingdom. I do not say that nothing is required at Cheltenham, but while there are Artesian wells and Abyssinian pumps there can be no need to go to the Severn. The water is not filtered at Shrewsbury, but it is taken above the sewers out-fall. The stream from Ironbridge enters the Severn above Bridgnorth. The case of typhoid at the gaol was, in the opinion of the gaol surgeon, due to drinking Severn water. He believed that was the case.

Re-examined: An inquest was held in the case of the death of the

prisoner at the gaol, and the verdict of the jury was to the effect that the death arose from typhoid, and they recommended that the water from the Severn, which had already been reported against by Dr. Farr, should form the subject of further inquiry. At Shrewsbury they had a double service—the water from a spring, which they recommended for drinking purposes, and the Severn water. But there was one district in which the spring water could not be supplied, and, when disease broke out in the town, medical men knew that there they could put their fingers upon the origin of it. The district was also a poor one. The Severn water at Shrewsbury was unfiltered, and so was that to which he had referred at Bridgnorth.

Rev. Dr. Morton Brown said he had lived in Cheltenham for upwards of 35 years, and had opportunities of ascertaining the feeling of the town. He signed the memorial sent in to the Corporation, and a large number of his fellow-townsmen also signed it. It was with a view of inducing the Corporation to acquire the powers of the Water Company. He signed that memorial with reference both to the present needs and future prosperity of the town. He thought the transfer to the Corporation was financially and sanitarially desirable. The Company would naturally seek largeness of dividends, while the Corporation would look at the supply in relation to the needs of the town. Sanitarially he looked at it that, being in the hands of the Corporation, they would study to supply the poorer as well as the richer parts of the town. Seeing that the town were anxious to purchase the works of the Company, he did not think it right for the Company to wish to go on supplying the town. He took part in the movement in 1865, against the introduction of Severn water, and was present at a public meeting in that year, and spoke. The opinion he held then he held now. During the interval he had had a conversation with the Company's Engineer, and he had represented that it was impossible to obtain a sufficient supply from the hills, and he was then shaken in his view, thinking that the Severn supply might be useful as a supplementary supply, still keeping the springs from the hills for drinking purposes. But hearing that a sufficient supply could be got from the hills, and that they did not need the Severn as a supplementary supply, he still held his former opinion, and that the town did not wish it. He thought the introduction of the water, the town not wishing it, would be very injurious. He attended a meeting in December last, and seconded a resolution in favour of purchase of the water-works. The resolution was adopted unanimously.

Cross-examined by Mr. VENABLES: He believed it would be a dire day for Cheltenham if the Severn water was introduced. He believed an ample supply of water very desirable, but he had the evidence of engineers that that supply could be obtained from the hills.

Re-examined by Mr. BROWNE: If the Severn water was going to be introduced, he should like it upon the separate service, but he hoped it would not be required.

Mr. Johnson Brown, Blenheim House, stated there was a very strong feeling in the town against the introduction of the Severn water. The feeling could not well be stronger. It had become very distinct within the past week.

Cross-examined by Mr. VENABLES: He had only seen the Severn as it flowed down its course. He had not seen the filtered water until now, and would not like to drink it unless he wanted an emetic. He looked upon the river bed as a sort of cemetery for dead animals.

Mr. Robert Mallory said he had lived 54 years in Cheltenham. Was formerly a member of the Board of Commissioners, and now of the Leckhampton Local Board. The feeling against the Severn water was very strong in Cheltenham, and he thought the Corporation should have the supply of water in their own hands. He was sure that the people would never be satisfied to drink the river water, and if it were introduced it should be as a supplementary supply on the separate service. They required water for Leckhampton, but were quite content to be put on the same terms as Cheltenham, or to have the price, in case of dispute, settled by arbitration. It would be a great advantage if there was a better supply to the poorer districts, which would be more likely to take it if the supply was in the hands of the Corporation.

In cross-examination, he said that he knew nothing of the powers of the Corporation with reference to the Company, nor whether those powers had been exercised.

Mr. T. Sanders said he had been in business for 22 years, and his firm (Messrs. Engall, Sanders, and Co.) were extensively engaged in house-letting in Cheltenham. He had heard frequent complaints as to the conduct of the Water Company, more particularly as to fittings, and he thought they were arbitrary in that respect. He knew cases in which parties had been put to large expense to change their fittings, and people had in consequence cut off the water. After their Act of 1865 the Company raised their rates, and since then they had been much complained of. There was a strong desire to get the works into the hands of the Corporation. He was instrumental in starting the memorial to the Town Council. Called on 131 persons, of whom 127 signed.

Cross-examined by Mr. VENABLES: He told those he called upon it would be conducive to the good of the town for the Corporation to have the works. He believed they would ultimately be a source of revenue to the town. Some of the Shareholders considered the price already offered to the Company not only a fair but a liberal one. He did not believe that they would get more by arbitration. He could not say that the Company had insisted upon anything illegal in their requirements.

Sir J. DUCKWORTH: We have heard nothing before of any offer having been made.

Mr. BROWNE said the fact would be put before the Committee.

Mr. J. B. Winterbotham, solicitor, said he had lived 54 years in Cheltenham. For many years he was a member of the Board of Commissioners, and was chairman of the Finance Committee of it. Was also on the Town Council. He was a member of the Public Health Committee, and had taken great interest in the water supply of the town. The Board made a requisition upon the Water Company, as far back as 1854, to supply 400,000 gallons of water a day; and in 1863 the question was again before them, attention being called to the insufficiency of the supply, and the abstraction of water from the sand-bed. A resolution was passed, and there were negotiations for the purchase of the works, which unfortunately ended in nothing. Then came the application for Severn water. It was strongly opposed by the town, and public meetings were held against it. The opposition of the Commissioners was in consequence of that feeling, the strength of which was admitted at the time by the Chairman of the Company in a report to the Shareholders. A rent-charge of £4500 was afterwards agreed upon as the price of the works, but the purchase went off on a question of rating, the Company considering their security injured by the exemption of the houses not taking the water. When the Company presented their Bill, there was also a proposal to take water from the Cerney Springs as a competing scheme, but it was very exceptionally thrown out on a second reading. The Company went for the Severn water in consequence of this proposal; that was admitted by the Chairman. It was the practice of the Water Company, whenever another scheme for getting water was proposed, to threaten Severn water, as a sort of dose of physic. The Severn was altogether unnecessary. A sufficient supply for street-watering, &c., could be obtained from the sand-bed. The



Corporation at present had no means of supplying baths, for which frequent application had been made. They could supply the water at a lower rate than the Company, as they would have no profit to seek for, and could borrow the money required on a town rate. The Company had screwed up their charges since 1865, so as to pay a much larger dividend without any further supply of water, still only supplying one-third of the houses in number, though two-thirds in rateable value. Many consumers of water had given up the Company in consequence of the charges, and he gave instances to this effect. The feeling of the town was decidedly against Severn water, and he believed it would be very prejudicial to the interests of the town. Whether the feeling was a prejudice only or not, it was very desirable that the water supply should be in the hands of the town. The Corporation were prepared to treat with the Company on good terms, either to take their works by arbitration, or to treat direct. The Corporation had made a liberal offer, and he believed if the Committee of Management had submitted it to their Shareholders, they would have accepted it.

Sir E. BECKETT: I will not discuss terms which may come to arbitration, but the Company's dividends have increased since 1864?

Witness: Yes. They were short of water then as they are now. The Tewkesbury works have not improved the Company's financial position; Cheltenham has paid for the loss on Tewkesbury. The Company have increased their dividends by increasing their rates, without any increase of supply.

Mr. E. T. Brydges said he was Town Clerk of Cheltenham, and was previously Clerk to the Town Commissioners. There had been frequent complaints as to the inadequate supply of water. In 1865 application was made to the Company to provide a supply for houses in Coach Road and Millbrook Street, but no supply could be obtained because the Company insisted upon making a charge for closets, and the total rate was more than the 2d. per week which the Corporation were allowed to impose under the Public Health Act. He had had a letter from the Clerk to the Company declining to supply the cottages unless they also supplied closets. That was in the time of the old Public Health Act. Since the new Act had been in operation, application had been made in the case of Leighton's Row, and then the Company proposed to charge £4 0s. 6d. on a rental of £56. They were only entitled to charge £2 16s., and the difference between the two amounts was the charge for closets. Under the new Public Health Act power was given to apply to the Local Government Board, under certain circumstances, to say whether the charge of a Company was a reasonable one. Application was made in this instance, but the Local Government Board stated that they had no power to interfere, there being a local Act in operation, and so, practically, the powers of the Corporation were nugatory, except so far as the supply could be put on for drinking purposes. As a fact, the mains were not carried into Millbrook Street until two months ago. As to fires, the Company had not been able to comply with the requirements to lay down mains in the private streets, of which there were about ten miles in Cheltenham, because they had no power to break up those streets.

Sir J. DUCKWORTH: Then no blame can be attached to the Company if they do not do so.

Witness: I am not imputing it to them as blame, but as a fact.

But the Corporation would have no such power?—Yes, they would.

Mr. BROWNE: That is the very point which we wish to bring out.

Examination continued: He was engaged in the contest of 1865, in consequence of the illness of his partner, the then Clerk. He heard the decision of the Committee, and it was decided, when the Company refused to supply the water on the dual service, that everything in the Bill relating to Cheltenham should be struck out. In consequence of this the Commissioners Counsel left the room, the business not further concerning Cheltenham. Was much surprised, when the Bill came to be printed, to find that all the clauses were not struck out. The Company had thus obtained the proviso with regard to an extra charge for closets and to the fittings, and both these had been used in reference to Cheltenham.

Cross-examined by Mr. VENABLES: He did not consider Cheltenham affected by the power of the Company to take the three million gallons from the river, as they had no power to bring it to the town. The Corporation had power to enter the private streets for the purpose of laying down mains. [A long and technical discussion here ensued between Mr. Venables, Mr. Michael, and the witness, on this point, but, ultimately, the witness's view of the law appeared to be admitted.] He thought the possession of these works should be in the hands of the Corporation, and this was an illustration of the principle; the Corporation being responsible for the suppression of fires should have control of the water.

Mr. VENABLES: There is nothing exceptional in the case of Cheltenham? Yours is an argument why all Companies should be in the hands of the Corporations?

Witness: Just so.

Re-examined: The possession of the water supply would be a great advantage; the supply of closets should be put on the same terms as that for drinking.

Mr. George Parsonage said he was Chairman of the Water Supply Committee of the Town Council, and for 24 years a Member of the Improvement Commissioners. He was formerly in a large way of business as a builder, and had much house property in the town. He had taken great interest in the question of water supply, and in 1865, as High Bailiff, presided at several meetings against the Severn water. The feeling was then almost unanimous, and he believed it to be as strong now. The feeling was also strong that the works ought to be in the hands of the Corporation. That feeling culminated in a memorial to the Town Council in favour of their acquiring the means of supply. It was signed by 850 persons, and was generally representative. A Committee were appointed, and negotiation for purchase attempted; but they could get no terms from the Company. The Corporation offered arbitration, but it was refused, and they then made a second effort to come to terms, but without success. At the statutory meeting of ratepayers, they were unanimously in support of the Corporation, and against the introduction of the Severn water. He then explained the source of the dissatisfaction felt towards the Company with regard to the fittings, which were unnecessarily expensive and arbitrary.

By Mr. VENABLES: The Company had no interest in imposing expensive fittings.

Mr. Andrew Paul said he was Chairman of a Committee appointed in 1870 on the water supply. The Surveyor then submitted a plan for the supply of water for public purposes, and to the poorer districts, but seeing that its carrying out would involve a large expenditure, and place an obstacle in the way of the future acquisition of the Company's works, an effort was made to approach the Company.

Mr. BIDDER: And do you share the almost unanimous wish of the town, that the works should be in the hands of the Corporation?

Witness: Most decidedly. The answer of the Company at that time was that they had no desire to sell. They declined to suggest terms, and the Commissioners could get no further; but expressed their regret at the result. The reasons for a transfer of the works remained now as they did then. He was not satisfied with the rates of the Company, in which there had been a great increase. An abundant supply in the public hands would

be a great boon, the Company being able to make what terms they liked for an article of which they had a monopoly. In the case of the Grammar School, for which he was concerned, an expense of £25 had been compelled for new fittings, and the rate had been raised from twelve guineas to £20, though the number of scholars had diminished two-thirds. He knew cottages rented at £8, for which the charge was 12s. a year, and no supply to the closets. He was concerned in the movement against Severn water in 1865. He believed its introduction would be a ruinous thing for the town.

By the COMMITTEE: I do not say that in 1870 we were at all satisfied we could get a sufficient supply. I am so satisfied now. That opinion is based on the evidence of an eminent Engineer, Mr. Bateman.

Dr. E. T. Wilson, F.R.C.P., said he had been for many years engaged in the collection and publication of sanitary statistics with reference to Cheltenham. He knew the Severn. He thought it a very unfit source of supply, because the river was very impure in itself, and because he had the very strongest objection to the use of a navigable river as a source of supply for drinking purposes, if anything better could be obtained. The Severn received the sewage of a large population, and he objected to it on that ground. As to the theory that the sewage would be oxidized or burnt up, as supported by Mr. Hawksley and Dr. Tidy, he did not agree with it, and thought there was quite sufficient evidence on the other side. In case of an epidemic upon the stream, he should not like to trust a run of 20 miles as destroying the danger of infection. Even if there were anything in the theory, and an epidemic raged at Worcester, a passing barge might drop the source of infection at the very mouth of the intake. Analysis would not show if water was medically affected. He had made the subject of water supply in relation to disease one of especial study. He had not met a medical man in Cheltenham who did not hold his views as to the introduction of the water. The feeling was very strong. He had prepared a diagram of Cheltenham, showing the relation of disease to water supply, and it showed that the centres of disease were identical with the districts in which water was taken from the wells. In consequence of the Company's charges, cottages were very poorly supplied with water. A large part of the mortality was due to the want of water in the poorer parts of the town. He had himself cured disease, and had arrested diarrhoea, by merely changing the water supply of the patient. In 1868 there was a great want of water; and it was on his report of a house-to-house visitation that the Commissioners took action in the case of Millbrook Street. The cottages there were absolutely without water, and he found typhoid in nine out of thirteen houses. He did not succeed in getting the mains put on at that time, and they were not laid down, in fact, until the present application had been made to Parliament.

(To be continued.)

## Legal Intelligence.

### EAST SUSSEX QUARTER SESSIONS, LEWES.

TUESDAY, APRIL 9.

(Before the Earl of CHICHESTER, Chairman, and other Magistrates.)

THE CORPORATION OF BRIGHTON, Appellants, v. THE GUARDIANS OF THE POOR OF THE STEYNING UNION, Respondents.

ASSESSMENT OF THE BRIGHTON CORPORATION WATER-WORKS.

This was an appeal by the Corporation of Brighton against the assessment of so much of their property in the water-works supplying the town of Brighton as is situated in the parish of Preston, which had been raised from £1800 to £4000.

Mr. E. CLARK, Mr. FINLAY, and Mr. HOPE appeared for the appellants; Mr. MEADOWS WHITE and Mr. LUMLEY SMITH for the respondents; and Mr. MERRIFIELD and Mr. GORE for the Overseers of the Parish of Preston.

Mr. CLARK, in opening the case, said the circumstances were of a somewhat complicated character, and there were a good many figure statements. There had been frequent communications between the parties, and he was glad to say that many of the points had been amicably settled. The water-works in question were vested in the Corporation of Brighton under the Act of Parliament, 35 & 36 Vict., cap. 86; and they were vested in them with certain powers and liabilities imposed upon them. The manner in which the financial part of the undertaking was to be dealt with was specified in the 36th section of the Act. After dwelling upon the manner in which similar cases had been dealt with by other Courts, he stated that one point upon which the Justices would, perhaps, find some difficulty was with respect to £2000 which had been paid over to the borough fund. The figures, a copy of which he would hand to his lordship, showed the rateable value in the parish of Preston to be £2732. This, with the proportion of the productive mains also in the parish, and estimated at £280, made the total rateable value £3012. It was at this amount that they asked the Court to assess the rateable value, and he thought when they came to look through the figures there would be little dispute between them. The points the Court would have to decide would be, first, whether they were entitled to deduct the £2000 which had been paid over to the borough fund under the 36th section of the Act of Parliament. Secondly, whether they ought to be rated as a matter of fact upon so much of the structural value of the works as they said were superfluous, and would not be rented by the hypothetical tenant. The question was, what the hypothetical tenant would give, and to get the rent which he would be likely to pay they must see what he would be willing to pay for in the year. What he would pay for would be what he wanted to use for that time, and if, for public purposes, the Corporation had put up works not required for present necessities, but which they would hereafter want to use, and would be a convenience to them, they, as the hypothetical tenant, would naturally say they were not liable to be rated at present for that which was now superfluous, and that they had nothing to do with the responsibility to be incurred 10 or 20 years hence. They did not enjoy the profit now, and what they had to pay for was what they used now. The third point to be considered would be whether the rate should be allowed at £4 or £5 per cent. upon the amount arrived at, and he submitted to the Court that as they were dealing in that matter with rateable value, £4 per cent. would be quite sufficient to allow as the rate to be paid for these premises.

Mr. Edward Easton, examined by Mr. FINLAY, said he was a Member of the Institution of Civil Engineers, and Engineer to the Brighton Water-works at the time they were in the hands of the Company, and also since they were taken over by the Corporation. They extended, in reality, over five parishes, two very small portions being in two parishes. Practically, however, they extended over the three parishes of Brighton, Hove, and Preston. Five of the seven reservoirs included in the structural works were situated in the parish of Preston, and were shown on the plan produced. In deducting, as had already been explained, the amount of £2000, which was placed to the borough fund in the year 1876, he made the rateable value £10,558. The figures £98,000, representing the structural value of the works in the parish of Preston had been agreed upon between himself and Mr. Ryde. To this an addition must be made for some land omitted from the calculation, but which he had since agreed upon with Mr. Ryde, amounting to £8000, making a total of £106,000. In his



view the structural value of the stations and productive mains which a tenant would pay rent for, was £60,300, and he estimated that the rateable value of that should be at 4 per cent., which would realize £2412. To that he had added the ground-rent, estimated at £320, which would make the total rateable value £2732. To be added to that was the proportion which the parish of Preston should receive for the remainder of the value of the whole concern. This he made to be £26,000 gross receipts, and not £28,000, to the receipts in the parish of Preston, which were only £1200. Together with this was the rateable value of productive mains in Preston, which he put down at £280, and which brought the sum total of the rateable value in Preston up to £3012. In his judgment that was the full amount of the rates to be paid during the year.

Mr. FINLAY: You state that the structural value is £98,000.

Witness: Yes, but I have taken 4 per cent. on £60,300 only, and the reason is this, that we have at Brighton in these water-works a very large excess of pumping power, and also of water-producing works, and in my judgment a tenant, a hypothetical tenant, coming to rent these works would not consent to pay rent upon at least one-half of the structural value of the pumping plant, and of the water-producing arrangement or works, and I have therefore deducted that. I have taken the structural value agreed upon between us, engines, engine-house, walls, chattels, and I have divided that by two, and deducted that from the agreed structural value, as being the structural value of the works which a tenant would really pay rent upon. Any one taking the works for commercial purposes would only consent to pay on one-half of these things.

Mr. WHITE: I have consulted with my friend Mr. Clarke, and to save what is usual in these cases, a very long inquiry, I am willing to take as the rateable value £10,558, *plus* the £2000; in other words, to argue upon the first part of the case this question only of their right to deduct from their receipts £2000. If I am right that they cannot deduct that, they will have to add the £2000 to the £10,558, making their rateable value £12,558. I will ask Mr. Easton on that point a few questions.

Mr. MERRIFIELD, on the part of the Overseers, said he had assented to that.

Cross-examined by Mr. WHITE: This estimate is, I believe, taken on the gross receipts for the year 1876. I have heard that the Corporation of Brighton hope to hand over from the water-works to the borough fund £4000 next year. They will, therefore, be £2000 richer from their water-works. But if a tenant were to come into the occupation of the water-works instead of the Corporation, he would not be £2000 the richer, because he would have to hand that over to them, or reduce the rates in accordance with the clause of the Act. The income which the Corporation derive from these works would be £2000 the better; and, apart from the Act, if the works were in the occupation of the Company, the larger the receipts the greater the rateable value up to a certain point. If the expenses remained the same, and the receipts became larger, they would be richer by reason of the occupation; and, assuming that a Water Company were allowed to make any amount of profit unrestricted by an Act of Parliament, of course, they, as the tenants of the works, could afford to pay a larger rent to the landlord. But as soon as the restriction begins to operate, and they can make no higher profit, they could not afford to pay a higher rent. In the present case the £2000 will be part of the profits actually made, and handed over to the Corporation. The rateable value of stations and unproductive mains is put down at £2732; the total rateable value of the whole concern, made up of productive and unproductive plant, is £10,558. In order to ascertain the total rateable value of the productive, we deduct from the total rateable value of the whole concern the £2732, which is the total rateable value of the unproductive, *plus* the rate on the structural value of the unproductive mains in the other parishes. That £60,300 is only in the parish of Preston. We have to add to that the total rateable value of unproductive mains elsewhere, which is £98,995. This does not include the portion which I call superfluous. There is nothing superfluous except in Preston, because the two pumping-stations are entirely in Preston. I have deducted one-half of the engine power and wells.

Mr. WHITE: What have you to add to that to make the rateable value of the whole?

Witness: You have to add to that £31,000 more, in round figures, for the unproductive mains in the other parishes; and £7500 for reservoirs in the other parishes. That is the only part we did not have time to agree upon. That is mainly the question between us.

If we treat as productive mains what you call unproductive, it would at once confuse your figures?—It would.

You have upon paper the structural value of stations and unproductive mains that are in Preston. Will you tell me what is the figure which ought to be put against stations and reservoirs if all the works under this description were brought into the rate?—I have taken the engine and boiler houses at Goldstone, £6250; the wells at Goldstone, £9500; the buildings at Lewes Road, £5900; and the wells at Lewes Road, £8500; making a total of £30,050.

If you take the whole of the unproductive plant in Preston, will it amount to about £100,000?—Yes, with the land.

Tell me shortly how that £30,000 deduction is made out.—Half of the engines and half of those items I gave you, including the wells, tunnels, and engine-houses.

Has every part of these works been in use during the whole of the year?—Every part, at different times.

Therefore, if a tenant had been in occupation, he would have used all these works?—No, he would not.

If he had been working the scheme of works as the Corporation did, he would?—Certainly, he would; but it is not necessarily so.

May I say they have been making use of the whole of the works?—Yes; they have been working the engines alternately.

Then they have not been useless to the Brighton Corporation?—They have been used; and, therefore, they have not been useless.

In point of fact, then, if we treat the tenant as coming into the possession of the Corporation, he would have used this plant if he had it?—He would have used it only to keep it in order.

The CHAIRMAN: Your point is to show that half the existing power is sufficient to provide for present needs?

Mr. CLARKE said that the fact that the plant had been used in the way Mr. Easton described proved nothing.

Mr. WHITE said he should prove it meant a good deal. (To witness:) Is it not an advantage—I do not say that, perhaps, according to your evidence, you could not get on without it—but is it not a substantial advantage in the working to have a double set of engines?

Witness: I do not think it is. My reason for saying so is this, that we at the present time contemplate drawing a report, which has for its object to do away with the Lewes Road works altogether; for the present, at all events.

You have not done away with Lewes Road altogether, have you?—No, we have not, because Goldstone was not in thorough working order until recently.

In the case of water-works where you have to give a continuous supply, is it not the case that you require more power than is absolutely necessary to meet contingencies?—Certainly. We consider that if we have a dupli-

cate engine, each engine capable of doing the whole work of the town, that we have provided quite sufficient.

Cross-examination continued: I have already stated that the engines are all used at times. I have never known the whole four used at once. We have sometimes supplied the whole town from Lewes Road. We use the Goldstone Bottom engine at times, pumping half the water from there, and half from Lewes Road. I do not think it is an advantage to have these two sources of supply, and we are going to do away with one. Including the £2000 referred to, there is a profit of £12,600 derived from these works, allowing all that a tenant ought to keep in his pocket. Hypothetically, that is the rateable value.

Mr. WHITE: It is a question between Brighton and Preston we are discussing, because if you do not rate this in Preston on the unproductive, it must be thrown on the productive?

Witness: I do not quite understand that.

You admit that the rateable value of the whole is £12,600?—Hypothetically I do.

After putting this £2000 to the Corporation, you have £10,600 left to pay to your landlord; and you say, instead of giving Preston part, it ought to be given to Brighton. If this is the mode of dealing with your unproductive works, you are taking from Preston and giving to Brighton?—I think not. There is the deduction I made for the second engine.

If you make Preston less, you make Brighton more?—We make Brighton and Hove more.

It is the struggle that the aggregate rateable value of the works was to remain the same?—The division of them.

Let us go to the wells and tunnels. Do you say there are distinct wells and tunnels, or do you say that the amount for the tunnels and the wells is too large?—In the case of the wells and tunnels I have not deducted so much as I might fairly deduct. There are several wells at each place; several at Goldstone Bottom, and several at Lewes Road, connected by tunnels; but the water does not go into a common reservoir. We have the means of shutting off the water absolutely, and can pump from one well with one engine, and from another well with another engine. The wells and tunnels are connected at each place, and work together. It is convenient to use both stations simultaneously, and it is sometimes done.

The CHAIRMAN: All his evidence is based upon the statement that the Lewes Road works are not necessary.

Mr. WHITE said in this case he should maintain that the mere necessity had nothing to do with it, if they had rateable works in full operation.

Mr. Joseph Quick, C.E., examined by Mr. FINLAY, said he was well acquainted with works of this kind. He agreed with the conclusions arrived at by Mr. Easton, as to the rateable value of all the works, as well as the value of the works in the Preston parish. There was certainly more plant than was really required for use at the present time at the works.

Cross-examined by Mr. WHITE: The total value of the plant in the parish of Preston was £105,200; in Brighton, £73,000; and in Hove, £15,000.

This concluded the case for the appellants.

Mr. WHITE, on behalf of the respondents, remarked that the only question between the parties, on the first part of the case, was with reference to the £2000, and that was entirely a question of law. Mr. Easton had told them it was a part of the expenditure of the tenant, but he (Mr. White) said it was applied as a part of the profits.

Mr. Edward Ryde, examined by Mr. LUMLEY SMITH, said he was a Surveyor, and one of the Vice-Presidents of the Institute of Surveyors. He had had great experience in valuations and assessments for rating purposes, and also in the valuation of water-works throughout the whole of England, and he made the valuation in the present instance, which was acted upon by the Assessment Committee of the Steyning Union. When the Corporation attended before the Committee and objected to the amount at which they were rated, he was present, and the objection that there was a superfluous supply of machinery at the water-works was not then raised. The contention of the Corporation was that they ought not to be rated at all. The way in which he estimated the rateable value was by taking the amount earned in the last year, and if there had been any superfluous machinery he did not take it into account, as it earned no money. What he took into account was the actual work done, and he assumed that the Corporation, at their works, had no more than the necessary pumps and engines to do the work. He was of opinion there was not more plant in the Brighton works than would be required, if they took into account the probability of an accident. The interest on the borrowed money was equivalent to the rent which would be paid by a tenant, and the £2000 was what was actually earned.

Mr. Barry, C.E., examined by Mr. WHITE, said in his opinion there was no excess of power in the works of the Corporation, and he did not find such a perfect duplication of parts at either of the stations as that one could be worked without the other.

This concluded the evidence for the respondents.

Mr. MEADOWS WHITE, addressing the Court, said the case had been divided by the respondent and the appellants into two parts—one, the rateable value of the entire concern, and the other the rateable value of what was properly rateable in Preston. It was perfectly clear that the first thing to be ascertained was what was the rateable value of the whole works, and they were agreed upon the result of that, less this one point of £2000. It must be taken, and had been laid down in railways and gas-works that each part must be considered as working towards the whole. They were to look, not to any particular part, but to the whole works as one apparatus, and it was only owing to the parochial division, which was an accident of the law of this country, so to speak—it was only by the fact that in this country they were obliged to rate property in the parish in which it lay, that this difficulty had arisen. It was admitted that the Corporation should be rated upon £10,000, and he should have no difficulty in satisfying the Court that, with regard to that point of law, in which the Corporation sought to exempt themselves from being rated on the additional £2000 that the Union was right. Regarding the point of superfluity, it had never been raised before until that day, and he maintained that the respondents had the strongest argument before the Court that the parish of Preston ought to have its full share of the £3000. In support of his contention that the £2000 should be taken as a part of the profits and become chargeable, he quoted a number of cases where it had been held that such was the usual course of procedure. The question of superfluity was a very ingenious one to put forward, but he considered they must pay what was a fair rent so long as the premises were occupied; and, as they were aware, they had been occupied for years, and continued to be up to the present moment. He thought the Corporation, rather than be charged with a wasteful expenditure of their capital in needlessly maintaining two establishments, and in that manner seeming to have been acting as wasteful trustees of public funds, would like to have it thought that they were beneficially occupied in these water-works, and as they were making £12,000 a year they would not mind giving to Preston that fair proportion to which it was entitled. The only other point that he dealt with was with regard to the per centage to be charged, and he maintained it was generally made 5 per cent.



Mr. MERRIFIELD having briefly addressed the Court on behalf of the Overseers,

Mr. CLARKE replied for the appellants.

The Magistrates then adjourned to consider their decision. After an absence of about a quarter of an hour, they returned, and

The CHAIRMAN said: We have carefully considered the evidence, and have talked it over in the other room. The Magistrates are unanimously of opinion that the assessment should be confirmed, costs to follow the event.

Mr. MERRIFIELD asked if the costs would be taxed out of Court.

The CHAIRMAN replied in the affirmative.

## Miscellaneous News.

### METROPOLIS WATER SUPPLY.

Major Bolton reports that the state of the water in the Thames and Lea was generally turbid and discoloured during the month of March. In the Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated), the water was good on the 1st, on the following day it became coloured, and increased in turbidity until the 9th, when it changed for the better, and improved in clearness on the 11th, and from that date it remained fairly good for the rest of the month. The highest flood state of the river at Hampton during the month was 1 foot 1 inch above summer level, and the lowest 3 inches below the summer level. Of the Companies drawing their supplies from the Thames, the West Middlesex, East London, Chelsea, and Lambeth have sufficient storage capacity and impounding reservoirs to avoid taking in water when floods prevail; the Southwark and Vauxhall, and Grand Junction Companies, on the other hand, are not so circumstanced, but have acquired land for the construction of suitable storage reservoirs and other works at Hampton. The Lambeth Company have given notice to commence a constant supply in a district bordered by the Kennington Park Road to the Elephant and Castle, the Walworth Road, and across Grosvenor Park and other streets, to the point of commencement at the Company's old offices, and are also giving constant supply in a number of courts and alleys.

### SHEFFIELD WATER-WORKS COMPANY.

The Annual Meeting of the Shareholders was held on Friday, the 12th inst.—Mr. W. COCKAYNE, Chairman of the Directors, presiding.

The following report was submitted:—

The report of the Directors, previous to the annual meeting of Shareholders in April, 1877, explained that the alteration of circumstances, since the order made by Vice-Chancellor Malins in 1872, had created a question respecting the continued application of that order, which the Directors proposed to submit to the decision of the Chancery Division of the High Court of Justice; and that, pending such decision, the sum of £19,991 19s. 3d., which would, under the terms of the order, have been appropriated for a dividend on ordinary shares for the year 1876, was carried to a suspense account.

At the time of the last annual meeting, the Directors hoped that the decision of the Court of Chancery on this question would have been given in the course of a few months; but the great pressure of business in that Court has hitherto prevented it being obtained.

The position of the revenue of the Company for the year ending Dec. 31, 1877, is, that after payment of all expenses, and the sum of £32,385 10s. for dividends on preference shares, there would, if the interest amounting to £19,652 16s. 9d. on the capital invested in works and land, not yet utilized for the supply of water, were charged to capital, in accordance with the terms of Vice-Chancellor Malins's order, remain a balance of revenue of £19,086 19s. 4d., which would have sufficed to pay a dividend of 4 per cent., for the year 1877, on the ordinary shares, leaving £612 19s. 4d. to be added to the surplus fund. Until, however, the Court shall have decided whether the order made by Vice-Chancellor Malins be applicable to the existing circumstances of the Company, the Directors consider it incumbent on the Company to abstain from making a dividend on the ordinary shares. They therefore recommend that, for the present, no such dividend shall be made, and they have carried the before-mentioned sum of £19,652 16s. 9d. to the suspense account, making, with the amount dealt with in like manner for the year 1876, £39,644 16s. 2d., the destination of which, as between capital and revenue, awaits the decision of the Court. When this decision is obtained, the Directors will, in the event of the Court having determined that the amount now in suspense ought to be treated as part of the revenue of the Company, convene a special meeting of the Shareholders, with which will rest the appropriation of this moiety.

The Directors refer to the gratifying fact that a demand for the water supplied by the Company is arising in the districts surrounding Sheffield. The supply of Chapelton is under consideration, and the Directors have undertaken the supply of the township of Dore. They are satisfied that both the extensions to Chapelton and to Dore will be remunerative to the Company, and they believe that they are only the first instances of a demand which is certain to rapidly increase, and most materially to aid the prosperous development of the Company's undertaking.

The depressed state of trade during the past year has much retarded the increase of the Company's revenue, especially that portion of it derived from water supplied for trade purposes. Notwithstanding, however, this serious drawback, the houses supplied by the Company are 1600 more in number than they were in 1876, and the aggregate amount of water-rates for the year 1877 is £344 13s. 11d. more than that for the preceding year.

The Directors have been able to effect a considerable reduction in the amount of interest paid for money borrowed. Up to this date they have borrowed on new and renewed debentures to the amount of £455,000 at 4 per cent. interest, the whole of the Company's debentures having previously borne a higher rate. This will not only cause an annual saving to the Company of about £2000, but affords a satisfactory proof of the estimation in which the stability and security of the Company's undertaking is regarded by the public.

The Directors have offered for sale in lots, by auction, 31a. 2r. 22p. of the Company's land at Crookes Moor, a ground-rent of £17, and the site of Limerick Wheels, with the surrounding land near Hillsborough. Two only of these lots were sold, realizing prices amounting to £2175.

The Directors had hoped that purchasers would have been found for a much larger portion of this property, but they have reason to expect that a considerable part of it will be disposed of by private contract. The money produced by this property will be applicable to the capital purposes of the Company.

Messrs. Hawkesley, the Company's Engineers, report that they have made their annual inspection of the storage reservoirs of the Company, constructed in the Redmires, Rivelin, and Loxley Valleys, and have ascertained that the whole of these works are in a sound condition and a good state of repair. The reservoirs now contain an ample supply of water to meet the requirements of the ensuing summer.

The Directors have had to regret the retirement from the Board of Mr. Samuel Roberts, who has been continuously a member of the direction since the commencement of the Company, 43 years ago. The Directors are satisfied that it is not necessary to recall to the recollection of Shareholders the important services Mr. Roberts has, during this long period, and frequently in difficult circumstances, rendered to the Company. The vacancy caused by his retirement was filled by the Directors by the election of his son, Mr. Samuel Roberts, jun.

The outgoing Board are composed of the following gentlemen:—Mr. William Cockayne, Mr. John William Hawkesley, Mr. William Sissons, Mr. Henry Crookes, Mr. Thomas Cole, Mr. Francis William Colley, Mr. Percy Smith, Mr. William Isaac Greaves, and Mr. Samuel Roberts, the younger, all of whom are eligible, and offer themselves for re-election. Shareholders are to have the power of voting by proxy at the ensuing meeting.

The CHAIRMAN moved, and Mr. HAWKESLEY seconded, a motion for the adoption of the report, which was put and carried unanimously.

Mr. BARBER moved a vote of thanks to the Directors, remarking that this compliment was the only thing by way of remuneration, that the Board received for their services.

Mr. HIDES seconded the motion.

Mr. J. WILSON inquired the amount of salary paid to the Manager, also

as to the arrangements of the Company with reference to charges for baths, and whether the difficulty in respect to payments for baths had not resulted in a large arrear of outstanding water-rates. He further wished to know why, after advertising the surplus land for sale, the offer had been withdrawn.

Mr. F. E. SMITH said there was a feeling some time ago on the part of the Town Council, and on the part of many of the Shareholders too, that the works of the Company should belong to the Corporation. A proposition was made in the Town Council by the present Mayor that the Corporation should buy the works, and Mr. Mappin, who was made one of the Committee to act in behalf of the Corporation, wrote to the Company. He waited a considerable time, and eventually had an interview with the Law Clerk, by whom he was distinctly told that no purchase could be made on any terms, and that the Company were not sellers. He (Mr. Smith) thought it would have been much better to have fixed some price, even if it had been a very high one, and that, as the Shareholders had been suffering from the loss of dividends for two years, they should have been consulted before the offers of the Town Council were thrown overboard. The Water Company's shares used to be spoken of by the late Mr. Albert Smith as the Sheffield Consols, and they were looked upon as the best investment that could be found. If the Shareholders took a survey of the water-works of the kingdom, they would find there was not one which was selling below par, while many paid 10 per cent. dividend. Since they met last year the Leicester Water Company had sold their undertaking to the Corporation at something like 165 to 170 per cent., and the Shareholders had derived a large benefit from it. He thought, at least, that in a matter of this kind the Shareholders ought not to be treated like a flock of sheep, and should have an opportunity of deciding for themselves whether they would sell their works. Last year they were told that there was a 4 per cent. dividend for them; but there was a certain difficulty in the way. It would have been a payment out of capital, and have necessitated an application to the Court of Chancery. They had not had their reply yet. There was, in fact, no 4 per cent. for them, nor 1 per cent. Their property was their ordinary shares, and he looked upon them at present, and for many years to come, as of no value whatever. If he were a poor man he should sell out at the present price, though he should have great difficulty in selling at 65. He quite recently offered to sell at 67½, and there were no buyers, though many sellers were on the Exchange. What were their prospects for the future? In 1874 the Company had an income from water-rates of £53,000; in 1875 it was £61,800; and in 1876, £67,000, showing a large increase each year, upon which the Shareholders were duly congratulated, and shown what a growing and improving property they possessed. In 1877 they heard that the total was £64,768, or a decrease of something like £2000. Then some one had spoken about the baths question, which he knew was a wide and a difficult one. He knew all about it last year, but did not then introduce it at the meeting, as he hoped it would be settled. He was content to pay a water-rent for his bath; but if others were not to pay for their baths, and were excused on that ground from paying their water-rent at all, why should he not also be excused? He had been charged water-rent upon his carriage-house and stables—for each horse and carriage—and, thinking the rate too large, he made a complaint to the Manager, who informed him that, as his house was rated at over £200, the amount would be abated. He maintained that it was very unjust that one person should be excused, and that another should pay. This year the Company seemed to be £600 short of paying the dividend on the preference shares. As an ordinary Shareholder, he wanted to know what right they had to pay a dividend on the late issue of preference shares when they were £600 short. Who was to make up that deficiency?

Mr. PERCY SMITH replied to the questions asked, as the Chairman was suffering from indisposition. He said the salary of the Manager was £1000 per annum, which he did not think was at all excessive. As to the use of water for baths, the Directors were being guided by their legal adviser, and they did not think it desirable to discuss the matter at the meeting. With reference to the surplus land, the sale was advertised last year, in the expectation that the Engineers plans would be got ready in sufficient time to have a good sale before the year closed. The difficulties, however, were too great, and numerous. There were many reservations to be made, and the Engineers had to be consulted with regard to all the pipes running through the land, in order that the Directors might see what they could and what they could not sell. Thus a good deal of time was spent, and, when all the preliminary arrangements were completed, it was found that too near the end of the year had been reached to have an advantageous sale. As to the point Mr. Smith had raised about negotiations with the Corporation, he really thought it was not advisable to say anything about it. The Board could only say that no proposals were ever made by the Corporation. The Corporation had shown no disposition to do anything but to try to get the Company on their backs, so as to acquire the concern as a ruined affair. The Corporation knew as well as the Shareholders that the latter had hold of an exceedingly good thing, and if the Shareholders would only have a little patience, which they were quite as able to show as the Corporation, they would realize a handsome profit in the long run. As to the question of application to the Court of Chancery, the report gave a sufficient answer. The decision would be given in due course, and the Directors must wait patiently until the decision was given. Mr. Smith had touched upon the general position of the undertaking; and, in reference to that, he would say it was sufficiently apparent to any one who was able to understand accounts, and who had a knowledge of the nature and extent of their works. The Company were incorporated with two main objects. The first and foremost was to give an ample supply of good water to the town. The second object was to give a reasonable return to the Shareholders for the employment of their capital. If, for the time being, the Company seemed to have failed in attaining the second object, it was only because they had been determined, come what might, that they would attain the first, and give to Sheffield an ample supply of good water. They had now supplied the town with water to such an extent that, for the time being, they were rather hampered with an excess of it, and not only had they a supply for the present wants, but for a population yet unborn, and for multitudes of men and women who, they hoped, would be attracted to the town by an extension of trade. If it should turn out in the future that a mistake had been made, the mistake was that the Directors had put too much confidence in the growth of the town. He believed, however, that with a gradual extension of the town would come a gradual increase of prosperity to the Water Company; and that the Company would soon be raised to the position of a dividend-paying concern.

The motion was then put and carried with two dissentients.

The retiring Directors were re-elected, and

Mr. COLLEY, in returning thanks, remarked in reference to the income of the Company, that the quarter just closed showed an increase on the corresponding quarter of last year equivalent to something like £2000 a year. He thought, when they considered the state of trade, and saw that they could get an increase at such a time, it was fair to assume that they would have a very large increase indeed as soon as trade revived, and as soon as the improvements and extensions mentioned in the report became remunerative.

The proceedings closed with a vote of thanks to the Chairman.



## WIGAN CORPORATION GAS ACCOUNTS.

The Town Clerk of Wigan presented to the Gas-Works Visiting Committee, at their meeting on the 16th inst., the following report in reference to the recent proceedings against the Corporation, before the borough Magistrates:—

Gentlemen,—The summons by Mr. Templeton against the Corporation, for non-compliance with the 35th section of the Gas-Works Clauses Act, 1871, was heard on Thursday last, and the Magistrates inflicted a penalty upon the Corporation of 3s. and costs.

I attended on behalf of the Corporation, and urged that the section in question did not apply to the Corporation, on the following grounds:—

1. The Gas-Works Clauses Act, 1847, and the Gas-Works Clauses Act, 1871, are to be construed together as one Act.

2. The Act of 1847 is divided into parts by certain introductory words, and it is enacted that for the purpose of incorporating or excepting any part of the Act, it is sufficient to refer to the introductory words.

3. One part of the Act of 1847 relates to profits of a Company carrying on a gas-works for their own benefit, and then follow a series of clauses providing for the amount of profit to be paid, what is to be done with the excess, and that when the profits exceed a certain amount a reduction is to be made in the price of gas, and power is given to the Court of Quarter Sessions to appoint an Accountant to report to the Court, and the Court may inquire into the matter and make a rateable reduction in the rate for gas. The Court has power to order the Petitioners to pay the costs in certain cases. There is a penalty for the non-production of books and vouchers. An annual account is to be made up by the Undertakers, and deposited with the Clerk of the Peace, and there is a provision as to the tender of amends.

The whole of the above provisions are contained in clauses 30 to 39 inclusive, and are all under the heading as to profits of a Company. The 35th clause of the Act of 1871 is clearly a substitution for clause 38 in the Act of 1847. The Wigan Improvement Act provides that the provisions of the Gas-Works Clauses Act, 1847, shall not apply to the Corporation as far as regards the provisions with respect to the amount of profit to be received by the Undertakers, when the gas-works are carried on for their benefit; so that none of the clauses of the Act of 1847, which I have specially referred to, apply to the Corporation; and I am of opinion that section 35 of the Act of 1871 does not apply, because it is to be construed with the Act of 1847, and is, in fact, a substitution for clause 38 of that Act.

Accounts made up under section 35 of the Act of 1871 may be useful to the Gas Committee for the purpose of thoroughly watching the progress of the gas-works; but, beyond matters of curiosity, they are of no use to anybody else, as it is quite clear that those accounts, in the case of Wigan, can never be made the subject of inquiry before a Court of Quarter Sessions with a view to the reduction of the price of gas.

The Corporation are bound to carry any balance on the gas account to, and it is to form part of, their district-fund account; and the Wigan Improvement Act throughout contemplates the dealing with the gas-works as municipal property; and the accounts of the Corporation as an Urban Sanitary Authority are, in my opinion, the only accounts which the Wigan Improvement Act contemplates being kept.

(Signed) MASKELL WM. PEACE.

## NEW GAS-WORKS AT TUNBRIDGE WELLS.

The inauguration of the new works for the Tunbridge Wells Gas Company, designed by Mr. R. P. Spice, C.E., took place on Thursday last, when the memorial stone was laid by the Chairman, Edward Marchant Hunter, Esq., in the presence of the Directors and Officers of the Company, and of a number of invited guests.

The proceedings commenced with an address from Mr. SPICE, who expressed a hope that the ceremony in which they were about to take part would prove a most auspicious event to the Shareholders of the Company and to the inhabitants of Tunbridge Wells. They were engaged in a most important undertaking—an undertaking which had been initiated with a large amount of public spirit on the part of the Directors, and also with a becoming sense of the responsibility it involved. Having enlarged upon the question of the mutual interests of Gas Companies and Consumers, he remarked that in the present day a notion was entertained by many that the supply of gas to the community was the special work of the Local Authority. This idea might, however, be carried out to an unfavourable extent, and he believed that it would be unfortunate for this country when private enterprise was thus nipped and thwarted, as even now was sometimes the case. He concluded by presenting to Mr. Hunter a trowel, which he said he felt sure he would use in the most workmanlike manner in the task before him.

The trowel bore the following inscription:—"Presented by R. P. Spice, M. Inst. C.E., to Edward Marchant Hunter, Esq., Chairman of the Tunbridge Wells Gas Company, on the occasion of his laying the memorial stone of the Company's New Works, on Thursday, 25th April, 1878."

Mr. HUNTER said it might be in the recollection of some present that, a few years since, their good friend Canon Hoare, whom he was glad to see with them on this occasion, visited America, and on his return he gave a graphic description of his experience there. Among the questions he was asked was one, put with some considerable degree of doubt—had they gas in the district in which he was living in England? He was able to reply in the affirmative. In fact, gas-works were not of recent introduction in that town, for as long ago as 1835 the basis of the present works was laid. In Gas Lane, which was then Golding Street, premises had been purchased by a private individual for the purpose of setting up gas-works. The extent of that ground was 98 feet in length, by 38 feet in breadth, or less than one quarter of the size of the retort-house now erecting. For some years the works were carried on in private hands, but a Company was ultimately formed, and in 1843 the interest in the buildings, &c., and the contract with the town, were purchased. After that, additions were made to the works, but even then not making them quite so extensive as the retort-house to which he pointed. The first year the Company had the works they did not carbonize more than 400 tons of coal, but the undertaking had increased year after year, to meet the requirements of the town, so that at the present time the old works comprised something like an acre in extent. But these were found too small for the requirements of the place, and, after much consideration, attention was turned to another site, and at last they fixed upon the one upon which they then stood. There the Company had ample room for extension, having nearly 7½ acres at their disposal, which he thought it would be admitted would give great facility for everything they would require for years to come. It had always been, and always would be, he trusted, the desire of the Directors to sell gas at the smallest possible price compatible with the interests of the Shareholders. Having spoken of the favourable position of the site with regard to railway accommodation, &c., he referred to the absence of accidents in the old works during the many years the Company had been serving the town, and expressed a hope that Providence would grant in the future the same safety to all concerned as in the past. He remarked that the existence of gas-works in the midst of a population was not unhealthy,

because it had been reported to them that the district of their works was one of the most healthy in Tunbridge Wells.

The ceremony of laying the stone was then proceeded with. The stone bore the following inscription:—"This stone was laid by E. M. Hunter, Esq., Chairman of the Tunbridge Wells Gas Company, April 25, 1878."

The Rev. Canon HOARE, having offered prayer, addressed the assembled workmen. After referring to many happy gatherings they had had in the old works, he expressed a hope that the same spirit would continue in the new as in the old works; adding, that as the Directors and his friend Mr. Scott, the Manager, had arranged so well for the honour of God in the old works, so he firmly believed they would continue to do it in the new, because of the blessing they believed would rest upon it.

Mr. SIMPSON thanked Canon Hoare for attending on the occasion. They had great reason to be thankful to the reverend gentleman, knowing as they did how ready he always was to answer the calls made upon him, however great the inconvenience might be to him. The address which he had delivered to the working men was equally applicable to all present, and he hoped every one would learn much, and be benefited by it.

Mr. W. DELVES, as the oldest member of the Board of Directors, proposed thanks to their Chairman, Mr. Hunter, for the admirable way in which he had conducted the proceedings of the day, adding that they were still more indebted to him for the admirable way in which he had conducted the business of the Company for the past 30 years as their Chairman, their prosperity having been due to the care, time, and ability he had devoted to the business of the Company. He hoped Mr. Hunter would live many years to preside over the Company, and see the new works, now in progress, completed and prosperous.

Mr. HUNTER having acknowledged the compliment, an adjournment for luncheon took place.

"Success to the Tunbridge Wells Gas Company" was heartily drunk, on the proposal of Mr. Hunter, the Chairman, as well as the health of the Engineer, Mr. Spice. The latter gentleman replied at some length, after which a survey of the works was made, and the proceedings terminated.

In the evening a dinner was given to the workmen of the Company.

## A NEW METHOD OF PRODUCING CHEAP HEATING GAS FOR DOMESTIC AND MANUFACTURING PURPOSES.

On Wednesday, April 10, at the Ordinary Meeting of the Society of Arts, Mr. S. W. DAVIES, A.R.S.M., read the following paper:—

It will be within the memory of many members of this Society that, in the year 1872, a sum of money was placed at the disposal of the Council of the Society of Arts, for promoting, by prizes or otherwise, economy in the use of fuel for domestic purposes.

A Committee was formed, to whom was entrusted the task of deciding on the best means for carrying into effect the wishes of the donor. A number of prizes and medals were offered for the best and most economical apparatus for cooking and heating, both by coal and gas. After a careful investigation of the claims of a large number of exhibitors, who forwarded their apparatus for trial in buildings specially erected for the purpose at South Kensington, the Committee decided that no prize could be awarded. But, although it was found that inventors had made little advance in the direction of economy of fuel worthy of the name, no doubt minds were set to work to try and fulfil the conditions under which the prizes had been offered. Among the various inventions which made their appearance after the conclusion of the Society of Arts experiments, was one by Mr. Joshua Kidd, the principle of which was that the gases from ignited coal were mixed with the hydrogen from decomposed water.

The complete gasification of the fuel used was a remarkable feature of the process, and it was this fact which led some gentlemen interested in the subject to adopt the idea, and to purchase Mr. Kidd's patent. Two years of patient trial, analysis, and experiment have enabled them to alter and adapt the principle contained in the original invention. Difficulties of all sorts have been overcome, and, although they are still on the way to improvement of the gas and its application in many directions, both for heating and lighting, they consider that, in its present state, it is of too great public importance, where a cheap heating gas is required, to delay any longer making its manufacture and application as widely known as possible.

Numerous attempts have been made by previous workers in this direction to produce a cheap gas for heating purposes, by the action of water vapour on incandescent carbon.

It has long been known that if steam be passed over coke or charcoal heated to redness, a decomposition of the steam takes place, hydrogen (H), carbonic oxide (CO), carbonic anhydride (CO<sub>2</sub>), and a small proportion of marsh gas (CH<sub>4</sub>) being produced.

The composition per cent. by volume of the mixed gas produced in this way is, according to Langlois' analysis—

H = 54.52 CO = 31.86 CO<sub>2</sub> = 12 CH<sub>4</sub> = 1.62;

according to Frankland's—

H = 56.9 CO = 29.3 CO<sub>2</sub> = 13.8.

It is evident, therefore, from these analyses, that we have here a very important heating gas, could we succeed in producing it in considerable quantities economically. How to do this most effectually has formed the subject-matter of numerous patents. It is not my intention to enter into a discussion on the relative merits and demerits of the various processes proposed in these patents, any such course, indeed, being rendered unnecessary by the fact that very few of them have been commercially a success. The cause of this want of success is not, I think, far to seek; the apparatus devised for carrying out the processes being for the most part large and costly, and rarely complete in itself, or what one may term self-contained—that is to say, in addition to the actual retort or generator in which the gas is produced, a special boiler and superheater are required for generating and superheating the steam used in the process, and in most cases the retort or regenerator requires to be set in a furnace and heated by a special fire, in the same way as an ordinary gas-retort. Or, if this course be not adopted, and only one fire used, viz.—that in the generator itself, then a special blowing apparatus becomes necessary, and the production of gas is intermittent instead of continuous, for steam and air have to be urged in succession through the same column of fuel, and it is only when the steam-jet is in action that gas is produced, the air blast being employed to blow up and revive the fire, the temperature of which is much reduced by the passage and decomposition of the steam.

I think it must be abundantly clear that these extra pieces of machinery and additional processes add very materially to the cost of erecting and working the apparatus, and also to the price of the gas produced, which, taken in connection with the large space occupied by the complete apparatus, entirely prevents it from coming into general use for small manufacturing and domestic purposes, thus shutting it out from what I conceive to be one of its widest and most important applications.

The apparatus I am about to describe and explain does not, it will be seen, labour under any of the disadvantages enumerated above; it is small, compact, by no means costly, and combines a gas generator, boiler, and superheater in one; it generates its own blast, is continuous in its action, and so easily worked that a person of average intelligence may be taught to attend to it in a few hours.



The generator consists of a hollow cylindrical body or case, made for convenience, at present, of wrought or cast iron, but which ultimately may be constructed of other materials. This cylinder is terminated below by a cast-iron bottom, having a hole in its centre about one-half or one-third its own diameter. Below this again, and forming part of the bottom casting, is a second hollow cylinder of the same internal diameter as the hole above it. In this lower cylinder the fire-grate is lodged; the blast-pipe opening into it below the fire-grate. The grate fits the cylinder loosely, and is attached to it on one side by means of a hinge, the other side being supported, when in position, by a pin screwed through the cylinder; this arrangement permits the grate to be readily moved up and down, and facilitates the withdrawal of the charge when necessary.

When making gas, the bottom of the small cylinder requires to be closed air-tight. This is effected either by means of a flat hinged plate, which is kept tightly pressed against it by a heavily weighted lever, or else by a short cap with a bevelled edge attached to it by a bayonet joint. In the upper and larger cylinder there is a coil of thick wrought-iron pipe, which fits the cylinder pretty closely, and is attached to it by means of a series of brackets or supports, which prevent the coil from collapsing by its own weight. At the bottom, the coil is protected from the intense heat of the fire by a thin lining of gannister. The two ends of the coil are turned outwards at right angles, and pass gas-tight through the body of the generator. The lower end is connected with an arrangement for supplying water under pressure, and the upper end with a steam-pipe of smaller diameter, which passes down parallel to the generator, and terminates in a small steam tap immediately in front of the blast-pipe.

The top of the apparatus is a casting of rather peculiar shape. In its centre there is a circular opening about nine inches in diameter, communicating below with a hollow inverted truncated cone projecting into the interior of the generator. At the apex of the cone there is a narrow cylindrical ring, which serves as the seat for a heavy conical valve, which fits it gas-tight. Above, this is surmounted by a short cylindrical fuel-box, carrying at its upper end a hopper, the opening between being covered by an ordinary flat sliding plate or valve. Attached to the fuel-box there is a short flue, used when lighting the fire, but closed when making gas. In addition to the central opening in the cover of the apparatus, there are two smaller ones; the larger of these being the gas outlet, and the smaller a peep or stoke-hole; this is closed, when not in use, by a gas-tight cap or plug. The whole apparatus is supported on three legs, attached to the flat underside of the bottom casting.

Presuming I have succeeded in making the construction of the gas-producer intelligible, it will, I think, be readily seen that, if a fire be lighted in the interior, and water driven through the coil, that water will be rapidly caused to boil, steam will be produced, which will accumulate in the upper part of the coil, and, if not immediately allowed to escape, will take up a further increment of heat, and pass into the condition of superheated steam. If now the tap in front of the blast-pipe be opened, this superheated steam will pass down the small pipe outside the generator, and blow with considerable force into the blast-pipe, carrying with it, by its inductive action, a stream of air. By properly apportioning the size of the steam-jet to the internal diameter of the coil, a constant supply of superheated steam is obtained, and, as a matter of course, a continuous blast of air ensured. In this way, then, the requisite oxygen to support combustion, and steam for decomposition, are driven into the apparatus with considerable force, from which, after traversing the column of heated fuel, they issue as a permanent gas.

Before, however, tracing the mixture in its upward course through the fire, it will, perhaps, be as well to describe the mode of working the apparatus, in order that you may see how very simple the operation really is. For this purpose, I will assume that the generator is empty.

Before lighting the fire, I shut the valve in the gas-main, open that at the bottom of the ash-box, lift the conical valve off its seat by means of the lever handle outside the fuel-box, close the steam-tap, and open the water-cock, so that I start, in fact, with the coil full of water, and the interior of the generator in free communication with the chimney. The fire is lighted in the ordinary way, the necessary wood, coal, &c., being charged in through the hopper; a light is applied to it from below the fire-grate, and the chimney draught draws up the fire in the same way as in a common closed stove. When the fire burns briskly up, as it generally does in about a quarter of an hour after lighting, unless it be fed too fast or otherwise checked, superheated steam will be abundantly produced. The steam tap may now be slightly opened, the valve at the bottom of the ash-box closed, and the fire more rapidly blown up by the steam blast, the jet being gradually opened as the intensity and body of the fire increases, until the full blast is given. In charging the apparatus with fuel, it is advisable not to use large lumps, nor, especially at first, to feed it too fast, otherwise an injurious lowering of the temperature in the upper part of the generator is likely to take place, and wet instead of superheated steam comes over. By a judicious use of the peep-hole this may entirely be prevented, as new fuel should only be added when the upper part of that already in the generator begins to appear red hot. The charge of fuel is put in the hopper, and the sliding plate withdrawn; this allows the fuel to fall into the cylindrical box beneath, and if the conical valve be up it passes direct to the generator; if, on the other hand, this valve be down, as is always the case when making gas for use, it falls upon and around the valve, and remains in the fuel-box till this valve be lifted, which, of course, should not be done before replacing the sliding plate between the hopper and the fuel-box. This mode of charging prevents any escape of gas into the room, and admits of the apparatus being fed as often as may be necessary while making gas.

When the generator becomes about one-third to one-half full of fuel, good gas will be abundantly produced, which may be turned at once into the gas-main. To do this, it is only necessary to drop the conical valve on its seat, and open the gas outlet, when, the communication with the chimney being cut off, the gas passes directly to the pipes and apparatus connected therewith.

The water is supplied to the coil under pressure. The necessary pressure may easily be obtained in either of two ways—viz., by a cistern placed at a sufficient height above the generator, or by a small accumulator standing alongside it, and provided with a hand force-pump and gauge. The latter plan is much to be preferred, as it enables the pressure to be altered at will, and brings the whole process well under control. For this purpose only a very small accumulator is necessary, and the amount of extra work thus thrown on the attendant is almost nominal. For instance, I have worked a generator producing about 4000 cubic feet of gas per hour with an accumulator only 2 feet high by 9 inches in diameter, and I found, even with so high a pressure as 60 lbs. on the square inch, a few strokes of the pump every quarter of an hour or so was all that was required to keep up the pressure and supply the coil with water. The accumulator we employ consists simply of a hollow cylindrical vessel provided with a force-pump and gauge, and containing air, by the compression of which any desired pressure may be obtained, from 1 lb. or 2 lbs. to 100 lbs. on the square inch; it acts, therefore, on exactly the same principle as the air-vessel of a pumping-engine.

Here I would call your attention to the absolute safety of this method of working, and to the impossibility of bursting the coil, even should a stoppage occur in it. The only thing that could happen in such a case as this is, that the water and steam in the lower part of the coil would, when the pressure rose high enough, be driven back into the accumulator, where the steam would be instantly condensed in the cold water, which it would barely warm, as the quantity of steam in the coil, compared with the quantity of water in the accumulator is extremely small. This arrangement, therefore, acts as a most perfect safety-valve, and prevents the steam pressure from ever rising sensibly above the ordinary working pressure.

Now, as we have seen, the air blast is set up and maintained by the inductive action of the jet of superheated steam playing into a small tube or blast-pipe, which opens into the cylindrical ash-box beneath the fire-grate. The intensity of this blast, therefore, will manifestly depend upon the water pressure in the accumulator; and as the force with which the gas issues from the generator will clearly be proportional to the strength of the blast, the whole admits of easy adjustment, to meet the varying conditions of pressure and resistance which the gas may have to overcome. With respect to the actual gas pressure obtainable in this way, I found experimentally that, with a water pressure in the accumulator of 15 lbs. on the square inch, I obtained a gas pressure in the generator of over 1 inch of water, and with a water pressure of 40 lbs. on the square inch, the corresponding gas pressure in the generator was 2½ inches of water. This latter is considered to be a good average working pressure.

The fire-bars are kept cool by the steam and air pressing between them, and are thus prevented from rapidly burning or oxidizing away.

The chemical reactions which occur in the generator I take to be very simple. Carbonic anhydride (CO<sub>2</sub>) is doubtless first formed by the action of the oxygen of the air upon the carbon of the fuel; this, in its passage upward through the heated fuel, takes up another equivalent of carbon, becoming reduced to carbonic oxide (CO) thus; CO<sub>2</sub> + C = 2CO, the nitrogen, of course, passing off unchanged, and serving only to dilute the gas. With respect to the steam, this, as explained above, is decomposed in its passage over the incandescent coal, with the formation of hydrogen, carbon-monoxide, and carbonic anhydride; the latter in its upward course sharing the same fate as the CO<sub>2</sub> produced by the action of the oxygen of the air,—i.e., it takes up another atom of C, and passes into the state of CO. The decomposition, therefore, of the steam adds materially to the calorific value of the gas, by enriching it with hydrogen and a further quantity of CO.

The composition of the gas produced by this generator, when working at different pressures of water, and with various kinds of fuel, has been determined by analysis. The result is as follows:—

Description of Fuel.	Pressure of Water per Square Inch.	Composition per Cent. by Volume of the Gas.
Peat charcoal . . . . .	15 lbs.	{ CO = 28·6
		{ H = 14·6
		{ CO <sub>2</sub> = 4·0
		{ N = 53·0
		100·2
Anthracite . . . . .	15 lbs.	{ CO = 22·6
		{ H = 10·0
		{ CH <sub>4</sub> = 4·9
		{ CO <sub>2</sub> = 4·5
		{ N = 58·0
		100·0
Equal parts of anthracite } and steam coal . . . . }	30 lbs.	{ CO = 28·3
		{ H = 9·3
		{ CH <sub>4</sub> = 5·2
		{ CO <sub>2</sub> = 6·2
		{ N = 51·3
		100·3
Anthracite . . . . .	60 lbs.	{ CO = 26·4
		{ H = 13·5
		{ CH <sub>4</sub> = 1·4
		{ CO <sub>2</sub> = 3·9
		{ N = 54·8
		100·0

As regards the quantity of mixed gases produced from a given quantity of fuel, this has been ascertained experimentally in the most careful manner, every precaution being taken to eliminate all sources of error. The gas from the generator was first passed through about 100 feet of 3-inch pipe, more than 50 feet of which was out in the open air, and then through a large meter.

Before reaching the meter, therefore, the temperature of the gas had been reduced to about 60° or 70° Fahr.

The following are the results:—

Description of Fuel.	Water Pressure in Pounds per Sq. Inch.	Cubic Feet of Gas per Pound of Fuel.
1. Anthracite . . . . .	15	69·5
2. Equal parts of anthracite and steam coal . . . . .	20	85·2
3. Equal parts of anthracite and steam coal . . . . .	25	88·84
4. Equal parts of anthracite and steam coal . . . . .	30	94·5
5. Anthracite . . . . .	40	(over) 100·0

It will be seen, therefore, that there is a steady increase in the quantity of gas produced per pound of fuel consumed, as the water pressure rises from 15 lbs. to 40 lbs. Beyond this point there does not appear to be much advantage gained by still further increasing the pressure; at least, this is the case in the smaller size generators, with which hitherto most of the experiments have been made. I confess it is somewhat difficult to account for the increased yield of gas at the higher pressures, as, of course, no one pretends to be able to obtain more than a certain definite quantity of carbonic oxide and carbonic anhydride by the oxidation of a given quantity of carbon. I think, however, it may be due in part to two causes. At the higher water pressures the force of the steam jet is proportionally increased; consequently, a larger volume of steam and air is injected into the apparatus in a given time. This gives rise to more intense combustion



of the fuel, which is, I believe, at the same time, more perfect combustion, and it is to this cause, and the fact that a larger volume of steam is simultaneously decomposed, that we must attribute the increased yield of gas.

After making numerous trials of different kinds of fuel, the conclusion arrived at is, that although a variety of non-caking fuels, such as coke, wood charcoal, peat charcoal, steam coal, &c., may be used, yet, on the whole, anthracite coal gives the best results, and is much to be preferred for use with the apparatus.

It might be thought that tying it down in this way to the use of one particular class of fuel, would very much tend to restrict the use of the apparatus, and practically shut it out from competition for steam-boiler purposes, especially on board ship. I do not, however, think this will prove to be the case. We have vast stores of anthracite coal, both in Wales and Ireland, at present almost unworked, and waiting to be developed; only a very small quantity being now raised for copper smelting, and a few minor purposes. So also in British Columbia, Vancouver's Island, and many other of our insular possessions, there are great quantities of this fuel lying practically useless, because as yet no practicable method of burning it economically in our ordinary furnaces has been discovered; indeed, it has been stated that at some of these places we have been obliged to establish coaling stations, and carry to them ordinary bituminous coal for the use of our steam ships, because our boiler furnaces are not adapted to burn the fuel already on the ground.

The use of what has been termed anthracite coke in marine boilers was advocated in a paper read last summer before the United Service Institution, by Captain Geary, R.A., in which he states that, by the use of this kind of fuel, burnt under blast in a specially constructed furnace, quite separate and distinct from the ordinary boiler furnace, or in what is practically a gas generator somewhat resembling the one I have described, he got a result which was superior as regards fuel consumed, and the speed of producing a certain effect, to a similar boiler fired in the ordinary way, in the proportion of 6 to 1.

In the discussion which followed the reading of this paper, the desirability of devising some means of utilizing anthracite for steam navigation purposes was insisted on by nearly every speaker, and the subject still excites considerable attention among naval architects and engineers.

I venture, therefore, to think that this apparatus is a step in the right direction.

Of all the proposed methods for generating a cheap heating gas, either for domestic or manufacturing purposes, the only one, so far as I know, that has hitherto met with much success, is the process patented by Siemens. This is now extensively used in the manufacture of iron, steel, glass, &c., both in this and other countries. It will, perhaps, be worth while, therefore, to institute a comparison between the quantity and quality of the gas produced by this process and the one I am describing.

In Percy's "Metallurgy," Vol. I., p. 528, the composition per cent. by volume of the gas produced by a set of Siemens's generators in work at St. Gobain, France, is set down as—

Hydrogen . . . . .	4 to 11 per cent.
Carbonic oxide . . . . .	15 " 19 "
Carbonic acid . . . . .	6 " 7 "
Nitrogen . . . . .	75 " 63 "

The first two of these constituents, or from 19 to 30 per cent., are alone of any use as fuel.

Turning now to the analysis of our gas given above, I find that the inflammable constituents stand in the proportion of from 37.5 to 43.2 per cent. The gas produced by this method, therefore, is much richer in heat-producing material than the gas produced by Siemens's method, and, of course, its calorific value is proportionally increased.

With regard to the respective quantities of gas produced by a given consumption of fuel in the two processes, I find Dr. Percy estimates that one ton of coal, exclusive of earthy matter or ash, is capable, when treated in the Siemens generator, of producing about 50,000 cubic feet of gas at 15° C.

The records of the experiments made with this apparatus, and of which I gave a brief epitome above, show that one ton of fuel treated in it yields from 155,680 to 224,000 cubic feet of gas; that is, from 3 to 4½ times the quantity yielded by the Siemens process. This gas, therefore, is both richer in quality, and produced in much larger quantity than Siemens—a fact which, if it stood alone, ought to be sufficient to prove the great practical value of the invention.

There is, however, one other point to which I would for a moment direct attention. Siemens's generators are large and costly, and the space occupied by the complete apparatus is very considerable; they are, therefore, only applicable to large manufacturing and metallurgical processes, such as those enumerated above, and are in no wise adapted for making gas for smaller works or private establishments.

On the other hand, these generators can be made almost of any size, either small or large, so that they are eminently adapted for use in small manufactories, such as chemical works, potteries, foundries, forges, drying processes, &c., where cleanliness, economy of fuel, absence of smoke, and simple regulation of temperature are required. Further, it is believed that the comparatively small cost of the apparatus, and the ease and facility with which it is put into operation, render it peculiarly fitted for making gas for domestic purposes. The use of gas as fuel is beginning now to be more generally understood and appreciated, and it is pretty readily admitted that, for cooking purposes at least, it is nearly as economical to employ gas as coal, with the advantage that it is much cleaner—there is no dirt, dust, or soot—and the saving in labour alone is very great. In addition, it has been clearly shown that the waste of meat when cooked by gas is from 10 to 15 per cent. less than when cooked in the ordinary way. At the London Hospital it has been estimated that a saving of £400 a year has been effected by substituting cooking by gas for cooking by coal; and a large employer of labour, on whose premises the cooking is done daily for about 1200 people, states that he is saving something like £800 a year in a similar way.

Of course, at both these establishments ordinary street-lighting gas is the fuel employed, and the burner used is that invented by Bunsen, and generally known by his name. The peculiarity of this burner consists in mixing air with the gas before it is consumed. Under these circumstances the gas burns with a blue, lightless flame, and there is no deposition of soot or carbonaceous matter; the gas is, in fact, perfectly burnt, the sole products of combustion being water and carbonic anhydride, or, as it is more generally termed, carbonic acid.

The gas produced by these generators is essentially a non-luminous gas. When taken direct from the producer, it burns with a reddish-blue flame. After having, however, been stored in a gasholder for a few hours in contact with water, the flame loses this red tinge, and the gas burns with a blue lightless flame very much resembling ordinary gas burnt in the Bunsen burner. In neither case is there any smoke, soot, or deposit of any kind by the burning gas, the sole products of combustion being water and carbonic anhydride. It is unnecessary, therefore, to mix air with this gas before it is burnt, as there is no luminosity to be destroyed, or deposition of carbonaceous matter to be prevented.

On the table there are two gas-burners; one is a Bunsen burner of the

ordinary construction, connected by a piece of tubing with the street gas supply; the other is simply a bent tube, somewhat resembling the Bunsen in shape, but having no holes at its base for the admission of air. This burner I will connect by a piece of flexible tube with a small holder in which a quantity of the heating gas has been stored for some hours. Both burners are now in action, and you see there is a marked resemblance between the two flames.

Of course, notwithstanding this similarity, there is a considerable difference in the calorific power of the two gases. Very careful trials show that it requires about five times the bulk of this gas, as of ordinary lighting gas, to heat a given quantity of water through a certain number of degrees.

But this comparison only holds good when the two gases are burned in the open air. The ordinary ring burner, which appears to be tolerably well adapted for use with common lighting gas, is not in any way an advantageous form of burner for our heating gas; but as the manufacture of special means is always an incumbrance to the application of any novelty, I think I am best recommending its use by showing you what our gas can do with the ordinary appliances in use.

We have ample evidence, in every direction experimented on, that the greatest development of heating power is obtained when the gas is burned in what may be called "partial confinement," or with the jets so enclosed that the air entering to support combustion is capable of being easily and accurately adjusted. As, however, this point remains to be more fully worked out, we will not take it at all into account in forming an estimate of the comparative cost of doing a given amount of work by the two kinds of gas, but will assume, as the basis of our calculations, that one cubic foot of coal gas is equivalent in heat-giving power to 5 cubic feet of the heating gas.

A No. 1 generator will produce on an average 1000 cubic feet of gas per hour, and consume about 10 lbs. of coal; taking a working day of ten hours, the consumption of coal will be about 1 cwt., and the gas produced 10,000 cubic feet.

The cost of the 10,000 cubic feet of gas will be as follows:—

1 cwt. of anthracite . . . . .	1s. 1d.
Wages of attendant . . . . .	4 0
Ordinary coal and wood used in lighting the fire . . . . .	0 2

Total . . . . . 5s. 3d.

The cost of the 2000 feet of lighting gas required to do an equivalent amount of work is from 7s. to 8s.

With the larger size generators the saving is still more marked. A No. 2 generator consumes about 35 lbs. of coal an hour, and produces 3500 cubic feet of gas an hour. The cost of the 35,000 cubic feet of gas produced in a working day of ten hours is as follows:—

3½ cwt. of anthracite . . . . .	3s. 6d.
Wages of attendant . . . . .	4 0
Ordinary coal and wood used in lighting the fire . . . . .	0 4

Total . . . . . 7s. 10d.

In heating power, this would be equal to 7000 cubic feet of ordinary London gas, costing from 24s. 6d. to 28s. It is, therefore, manifest that where the consumption of gas is considerable, a most important saving is effected by using the larger size apparatus.

I think, however, it is only fair to say that when working the No. 1 generator the attendant's time is by no means fully occupied; indeed, in some experiments I made with the apparatus, lasting over several weeks, one man attended to three of them with the greatest ease.

The cost of the application of this gas for large establishments will depend on the rate, and the varying quantity of the consumption; if this be constant and continuous, it is not absolutely necessary to introduce even a pressure regulator between the generator and supply-pipes, as the gas can be carried direct to the cooking and heating apparatus, and there consumed. The only advantage gained in such a case as this, by the use of a governor, is that the pressure in the main is kept constant while charging the generator with fuel.

If, however, the gas cannot be usefully consumed as fast as it is generated, then it becomes necessary to employ a holder, and to store the gas in the ordinary way. For this purpose any common gasholder may be used, no specially constructed holder being required.

The gas can be sent direct from the generator to the holder, without passing it through a scrubber or other apparatus for washing or cleaning it, as there are no tarry or ammoniacal products to be condensed or removed. Also the pressure under which it is produced is sufficient to overcome a resistance measured by a column of water 2 inches in height, and this, in a common gasholder, is amply sufficient for most purposes. No adjustment of the weights, therefore, every time the holder is filled, becomes necessary.

At the works in Battersea the gasholder is generally kept weighted, so as to give a pressure in the mains of about 1½ inch to 2 inches of water. Not the slightest difficulty is experienced in working the apparatus against this amount of resistance, with a water pressure in the accumulator of 40 lbs. on the square inch.

I have often been asked whether this gas does not become deteriorated by being stored in contact with water. Some people seem to labour under the misapprehension that, because it is produced in part by the decomposition of water vapour, there is a corresponding tendency towards condensation; they appear to forget that the constituents of the water have been separated by the action of the incandescent fuel, and transformed from a readily condensable, completely—or at least permanently—oxidized gas or vapour, into two gases, which at ordinary temperatures and pressures are non-condensable, but slightly soluble in water, and only one of which is partly oxidized.

To prove, however, that the gas suffers no material change in composition by being stored in contact with water, an analysis was made of a sample that had been kept in the gasholder for more than a week. This gas contained in 100 parts as follows:—

Carbonic oxide . . . . .	CO = 24.3
Hydrogen . . . . .	H = 15.5
Carbonic anhydride . . . . .	CO <sub>2</sub> = 3.4
Nitrogen . . . . .	N = 56.8

Total . . . . . 100.0

On comparing this analysis with those of the unstored gas given above, it is manifest that no bad effect is produced on the gas by storage, and that it may be kept for any reasonable time in a holder without deterioration. This, therefore, disposes of the question of the storage of the gas in holders, &c.

I mentioned, however, just now, that in large establishments—such as clubs, hotels, hospitals, barracks, unions, prisons, &c.—in which the consumption of gas for cooking and heating purposes would of necessity be large, no holder is required, as the gas can be used direct from the generator. This has been practically demonstrated in the most complete manner at the works of Messrs. Leoni, where a long series of trials were carried out with the apparatus, and in every case the gas was passed direct from the generator into the 4-inch main, with which the various cooking and heating stoves to be experimented on directly communicated. No pres-



sure regulator or governor of any kind was employed in these experiments, neither was there any alteration made in the apparatus to adapt it to the use of this gas, except the stopping up of the air-oles in the atmospheric burners.

In one trial two large ovens, each 5 feet high, by 2 feet 3 inches wide, by 2 feet 6 inches deep, a boiler holding 55 gallons of water, and a large steamer, were joined up to the 4-inch main. At first the whole of the gas produced was turned into the ovens and boiler. In 75 minutes after lighting the gas, the ovens reached a temperature of 400° Fahr., and in 15 minutes more the water in the boiler was at the boiling point. The gas under the boiler was then nearly turned off, that in the ovens being slightly lowered, and the steamer got to work. In 30 minutes after lighting there was an abundance of steam for cooking purposes. This steamer is calculated to cook 1 cwt. of potatoes in about 30 minutes. All this time the ovens were kept at a temperature of 400° Fahr.

The actual quantity of ordinary gas required to work the ovens and boiler, or ovens and steamer, is from 280 to 320 cubic feet an hour. Estimating the quantity of gas produced by the generator at 1200 cubic feet an hour (which is its outside rate of production), it will be seen that the comparative heating effect of the gas, as determined by these trials, is considerably higher than that assumed when making the calculations given above. Since this trial was made, Messrs. Leoni have tested the apparatus in all sorts of ways, and in every case with pretty much the same result. Not the slightest difficulty has ever been experienced in using the freshly prepared gas direct from the producer, without the intervention of a gasholder or pressure regulator of any kind. This is justly looked upon as a very important point, especially as regards the application of the gas in large towns, where gasholders would be often inadmissible, and the introduction of pressure regulators even might in some cases be attended by considerable inconvenience. We are now, however, in a position to state positively that such adjuncts can, in the case of large establishments, be entirely dispensed with, and that the gas may, for cooking and heating purposes, be directly applied.

Experiments of a somewhat similar kind to those detailed above were made on soldiers cooking apparatus at Wellington Barracks. As, however, the results were in both cases almost identical, it will be unnecessary for me to enter into a long description of them. I will, therefore, confine myself to one experiment. In one of the cook-houses there is a large Dean's roasting and baking oven—internal measurement, 4 feet × 2 feet × 2 feet = 16 cubic feet contents. To this oven it was decided to apply the gas. For this purpose it became necessary to devise a special burner, as the oven is arranged for burning solid fuel. The burner employed was made in the form of a cross, each arm having in its upper side a circular opening 2 inches in diameter for the exit of the gas. This was placed in the fireplace, and connected with the generator by a 3-inch main, and the whole of the gas produced by a No. 1 generator burned in it. The flame from the burning gas did not impinge directly on the flat iron bottom of the oven, but upon the invert of a flat arch of fire-brick, 4 inches thick, closely applied to it, and forming the crown of the furnace. This arch and brick lining of the fireplace were raised to a bright red heat in about 45 minutes after lighting the gas. The temperatures attained by the oven were as follows:—

30 minutes after lighting, temperature	235° Fahr.
45                   "                   "                   "	336°   "
60                   "                   "                   "	450°   "
75                   "                   "                   "	523°   "

Before making this trial, the oven had been lying neglected for some months, as it was considered by the cooks to be a particularly badly constructed one, in which, on account of the sluggish draught, they were unable to either bake or roast properly. They were not, it is true, very sanguine of our being able to do with gas what they had failed to do with solid fuel, and were at first rather inclined to shake their heads and smile incredulously. The result, therefore, took them completely by surprise. They have a rough-and-ready method of ascertaining approximately the temperature of the interior of their ovens by touching the iron knobs on the doors. Just before the close of the trial they came one after the other and applied this test—which to them was a much more satisfactory one than the indications of a thermometer—and they declared that if they had fired the oven in the ordinary way for a whole day it would not have been so hot. Even with the best constructed ovens, it takes them from two to two and a half hours to get up the same heat that we reached in a little over an hour, and that, too, with a much greater consumption of fuel. Thus, the No. 1 generator used in this trial consumes from 10 to 12 lbs. of coal an hour. Their furnaces, as near as one could ascertain, burn from 15 to 18 lbs. of coal an hour; consequently, we did with from 12 to 15 lbs. of coal in 75 minutes what it takes them 120 to 130 minutes to do with from 30 to 40 lbs. of coal.

The most eminent metallurgists and engineers have long maintained that the most perfect kind of fuel, for either manufacturing or engineering purposes, is gas. It will be quite useless, therefore, for me to stop to insist upon this point, or do more than just indicate some of the advantages that have been claimed for this kind of fuel. Briefly, these are as follows:—

1. Saving of fuel, less being required to do a given amount of work.
2. Increase of work done in a furnace of given dimensions, being the result of the great calorific power at command.
3. Complete command over the heat of the furnace.
4. Perfect uniformity of heat throughout the furnace, and greater durability of brickwork, owing to the absence of ashes, by which the fusibility of the surfaces with which they come in contact is much increased.
5. The production of a flame of such purity as to diminish materially the waste by oxidation and deterioration of the metals, &c., operated on.
6. Increased command of the heat employed, and of the chemical effects produced by the flame, which can be immediately checked when required, or at once changed from an oxidizing to a reducing one, or vice versa.
7. Great cleanliness.
8. Absence of smoke and soot, which, in the neighbourhood of large towns, is of great importance.

These admirable qualities have led to the adoption of this kind of fuel in a number of works, and for a variety of purposes. The great bar that has hitherto prevented it from being much more extensively used is, as before mentioned, the cost and size of the generator and its appendages. It is, however, believed that now simple means have been discovered of producing a richer heating gas than that hitherto employed, and in any quantity at pleasure, either large or small, to suit the special purposes for which it is required, that its well-known and manifold advantages will ultimately result in its being almost universally adopted in small as well as large works, to the exclusion of the grosser forms of fuel; and that it is only necessary to make the existence of this apparatus more widely known to ensure a steady and increasing demand for it.

A series of experiments have been made, with the view of showing the applicability of this gas to the heating of furnaces for metallurgical and other processes. Of course, no experiments were needed to prove that in

a properly constructed furnace a very high temperature could be obtained by the use of gaseous fuel, as that point has long been set at rest by Siemens and others. But it was necessary to show to intended consumers that our gas could be utilized in this way, and that in a furnace of corresponding dimensions, as high a temperature could be attained by the consumption of the gas produced by this small generator—burning on an average 10 lbs. of fuel an hour—as by a large apparatus consuming from 2 to 3 tons of coal a day, and that, too, if possible, without the use of those large brick regenerative chambers, which are so costly an adjunct to the larger apparatus.

With this view we had constructed a small furnace, to which was applied the gas from a No. 1 generator. I shall not trouble you with the details of this furnace, as it was so obviously defective in many respects that to describe it in its present form would be useless. Suffice it to say, notwithstanding these defects, by means of an extremely simple accumulating and reversing arrangement, a temperature of from 2000° to 3000° Fahr. was readily attained in it, and cast iron melted in a few minutes.

This result is so far satisfactory, but it falls very far short of what can, and will be, attained with an improved construction of furnace. On this point, however, further experiments are much needed, in order to put this very important matter beyond the possibility of a doubt; but such experiments, I need hardly point out, require time and means.

As regards the application of the gas for steam-boiler purposes, comparatively few experiments have been made, and those only of a very rough description; the results, however, tend to show that, with better modes of applying the gas, and with the experience gained in those trials to guide us, very much better things may be expected from any future trials.

In some experiments made at Woolwich Arsenal on a small boiler in the chemical laboratory, we succeeded in getting a considerably greater evaporative effect, per pound of fuel consumed, than was obtained when the same boiler was stoked in the ordinary way.

Of course, in making such experiments as these, it has always to be borne in mind that the apparatus under trial must be adapted to the boiler, and not the boiler to the apparatus. This is the principle on which the experiments at the Arsenal were conducted, and I must confess my opinion now is that, in tying ourselves down too rigidly to this rule, we committed a grave error. For it is obvious that it is next to impossible to obtain anything like the full calorific power of gaseous fuel by attempting to burn it almost without preparation of any kind in the large ill-constructed furnaces in which so much solid fuel is now wasted in our boilers.

However, as I said just now, we gained valuable experience from these trials, and the result was far from being an unsatisfactory one, notwithstanding the crude way in which the gas was applied.

If, in future, we should be in a position to undertake fresh experiments in this direction, and a judicious combination of the experience thus gained be effected with another well-known experimental fact, viz., that in a combustion chamber, if the walls be persistently kept far below the temperature at which combination of oxygen and hydrogen, or oxygen and carbon, takes place, the resulting combustion must of necessity be imperfect. I have no doubt a far different result will be obtained, and the immense superiority of gaseous over solid fuel, for boiler purposes, be most completely demonstrated.

Respecting the use of the gas for illuminating purposes, I have not much to add. We have seen that, as it comes from the producer, it is essentially a non-luminous gas. Attempts have been made, during the process of manufacture, to convert it into a permanent illuminating gas, by throwing into it the necessary proportion of carbon; as yet, however, these attempts have only been partially successful.

Of course, the gas can be carburetted in the same way as common air, by passing it through a peculiarly constructed vessel termed a carburetter, containing the highly volatile distillate from petroleum known as gasoline. Under these circumstances, it takes up a quantity of the hydrocarbon vapour, and becomes transformed into a luminous gas of considerable power. With the special burner recommended for use with this gas, as high an illuminating power as 19 parliamentary sperm candles has been obtained, and an average light of from 15 to 16 candles, with a consumption of about 5 cubic feet of the carburetted gas per hour. I have here a small carburetter containing gasoline, and connected with it is one of the special Argand burners. I will pass some of the gas from this holder through the vessel, and show you the flame of the carburetted gas; and in order that you may form a better estimate of the change effected in the gas by this process, I will again light the simple bent tube burner we employed just now. This, as you see, is connected with the gasholder direct, and not with the carburetter. Both burners are now in action, and you can judge of the effect produced on the gas by mixing with it the vapour of the volatile hydrocarbon.

It will, perhaps, be as well to state here, that this carburetting process forms no essential part of the principle of the apparatus I have described; it is only looked upon as a useful adjunct in places where coal gas cannot be readily obtained, and it is not intended for one moment to compete with the latter for illuminating purposes.

When it is intended to carburet the gas, and to employ it as a source of light as well as heat, it becomes absolutely necessary to use a gasholder, both to store the excess of gas made by the generator, and also to equalize the pressure, which in the generator itself is liable to slight fluctuations, of no consequence whatever when the gas is simply used as a source of heat, but highly objectionable when it is employed for lighting also.

In reply to a question by Mr. Hale,

Mr. DAVIES said that the cost of the gas was about 5s. 3d. for 10,000 cubic feet in a small generator, but when a large generator was used, the cost was 7s. 10d. for 35,000 cubic feet, or about 3d. per 1000. This was equivalent in heating power to 7000 cubic feet of ordinary London gas, costing from 24s. 6d. to 28s. It was not supposed that the apparatus could be introduced into every small household; it was rather intended for large country establishments, where ordinary gas could not be readily obtained, and in manufactories and places where a clean fuel, free from dirt, ashes, and sulphurous compounds, was required. In reply to another question, as to whether the gas was explosive, he said that all gases were explosive when mixed with oxygen in certain quantities; but owing to the large per centage of nitrogen, this one was very little explosive. In fact, he had at times found considerable difficulty in making it explode when mixed with pure oxygen and an electric spark passed through it.

Sir FRANCIS KNOWLES said that some time ago he was allowed by the proprietors of this invention to inspect their works at Battersea, when he was much struck with the extreme cleanliness and simplicity of the invention, but there was one element on which he must offer Mr. Davies his condolence, namely, the large quantity of nitrogen, which must considerably reduce the temperature of combustion, and, therefore, the effective heat of the fuel. If the inventor could succeed in getting rid of that—and he saw no reason why he should not—the temperature would be much increased. He did not know whether Mr. Davies had calculated the temperature of combustion, but that was a most important element. If to boiling water was added an equal quantity of cold water, there would be only obtained a heat much below the mean of the two temperatures, and



the introduction of this nitrogen, which was inevitable, it appeared, at present, in consequence of the combustion of fuel necessary to vaporize the water, would act in the same way as cold water, and must, of course, very much deteriorate the value of the fuel. This use of water gas was by no means novel, the only novelty being the form of the apparatus. Some years ago the proprietors of some large iron-works in the North endeavoured to apply it in their blast furnace. They collected a large quantity of it in a gasholder, their idea being that it would save fuel by blowing it through the tuyeres in combination with the ordinary blast. On writing recently to ask the result, the answer was that unfortunately, after they had worked it a short time ago with no particular advantage, owing to the neglect of a little urchin entrusted with an important function in the process, the whole affair disappeared into space, and unfortunately the little urchin disappeared with it. But he had obtained an analysis which very much differed from that in the paper. Mr. Davies had only given the analysis by volume, and not by weight. The analysis he referred to was as follows:—H 56; CO 29; CO<sub>2</sub> 15.80; Light Carb. Hyd. 3, so that the nitrogen was entirely absent. He did not exactly know the process by which it was manufactured, but it was so arranged as to exclude the nitrogen, and he thought it would be well worth the while of Mr. Davies and his allies to turn their attention to that point. In other respects it appeared to him a highly useful application, more particularly for domestic uses, for he considered it would be limited to that rather than being applicable on anything like a large scale in manufactures; because in the comparison with the heating power of fuel it would be found that its heating power was not so great. At the same time he did not at all wish to find fault with the invention, but simply spoke the truth in the interest of science, to point out where the imperfections lay. He should like to see a bit of platinum wire placed in the flame to test its heating power. [This was done, and the platinum wire was heated to a bright red.] He said that had it not been for the presence of nitrogen, the wire would have been of a dazzling white. He then repeated the analysis he had previously given, and added the analysis by weight—namely, H 10.51; CO 51.59; CO<sub>2</sub> 33.26; Light Carb. Hyd. .63. He might also say that in all these gases, which ought properly to be called wet gases—gases containing hydrogen, particularly when burnt with common air, there was a great loss of heat, owing to the generation of aqueous vapour in the products of combustion, the specific heat of aqueous vapour being very high indeed, about .836, so that, in fact, it took away very nearly all the heat generated. There was also an enormous quantity of nitrogen imported in the process of burning this hydrogen. It would be found that all wet gases, as he might call them, produced very much less effective heat than what might be called, in comparison, dry gases, namely, those into which no aqueous vapour entered. There was the advantage in this gas that there was not any very great quantity of sulphur, and what there was, was not in a prejudicial form. As far as he could understand the apparatus, it seemed to him perfectly protected from anything like explosion; and there was not much danger of asphyxiation, which was another important point. He should like to know whether Mr. Davies had ever tried an experiment in a grate full of asbestos.

Mr. DAVIES said that he had tried it, but not in a very complete form, or in such a way as he would care to describe.

Mr. F. W. HARTLEY said he had been a good deal interested in, and connected with the manufacture of water gas, so called, and he did not believe in the necessity for the presence in such gas of so large a proportion of carbonic acid as nearly all analyses indicated, for, by proper arrangements, it was possible to resolve most of that first formed into carbonic oxide, and thereby obtain a gas which was superior to hydrogen in heating effects; because, according to the very appropriate distinction made by Sir Francis Knowles, it was a "dry" gas, while hydrogen was a "wet" one. In spite of the advantages which, at first sight, water gas, seemed to possess, it was a fact that it was inferior in heating power, as compared with coal gas. If this were so with water gas, it must be necessarily much more so with a mixture containing 56 to 57 per cent. of nitrogen, which was not only useless for heating, but worse than useless, because it prevented the flame produced by the combustible gases obtaining the temperature necessary to give the best result. Some two years ago he saw Mr. Kidd's process in operation, and was much struck with it, believing that, for smelting purposes on a small scale, the inventor had effected a very important invention, and thereby rendered a great service to the world; but he could not follow him into the conclusion that this gas could compete successfully with the gas obtained from the ordinary gas companies for the purpose of heating or lighting. With regard to heating, they were told already that it required something like five volumes of this gas to produce the same effect as one volume of ordinary coal gas. He was quite prepared to believe that it would require even more, but supposing it took only that, there would still remain the question of the cost of production; and he must say he was considerably startled by the statement that 1000 cubic feet of gas were produced from 10 lbs. of fuel. If the nitrogen were left out of the question, it came to something like 43 feet per pound of fuel employed to produce carbonic oxide, hydrogen, and carbonic acid, and he was hardly prepared readily to receive that, knowing as he did that in the production of water gas, although theory taught that, per ton of carbon used, nearly 200,000 cubic feet of gas should be produced, practice indicated quite a different thing. In America, where they had been trying this a good deal, it was found that, in order to produce 1000 cubic feet of hydrogen gas, they were obliged to employ 70 lbs. of fuel, the fuel being very analogous to the anthracite employed here. He was also startled by another statement—viz., that, following an elevation of pressure within the tube, an increased volume was obtained. He was not surprised, in one sense, for the reason that, by increasing pressure, the velocity might be increased through the tuyere or pipe, leading to an increase in volume by the addition of a larger proportion of nitrogen. He could not follow the figures showing the analysis of the gas obtained under different pressures. The difficulty he felt was to understand how, if increased pressure produced "more perfect combustion," the carbon was not to a greater extent converted into the useless gas, carbonic acid, instead of being mainly resolved into the useful gas, carbonic oxide. It seemed to him that the apparatus wanted greater depth to produce the best effects from the decomposition of the fuel, because experience had taught him that, for the best results in the decomposition of steam, there must be a tall column of carbon for it to pass through. The first impact converted the oxygen of water into carbonic acid, which by passing through a large mass of incandescent carbon took up another atom of carbon, and became converted into carbonic oxide.

Sir FRANCIS KNOWLES said he might give a simple illustration of the importance of excluding the nitrogen. Every one knew that the oxygen-hydrogen blowpipe gave almost the highest temperature known, which would melt platinum, but if it was attempted to burn the same gases with atmospheric air, only some of the more fusible metals could be melted. He would also suggest that nothing would be easier than to get rid of the carbonic acid altogether, by passing the whole gas through a second retort. Then if the nitrogen were also got rid of, there would be a gas of very considerable heating power.

Major WEBBER said that many interesting suggestions had been made, but those who were carrying on the process had for the last two years

been almost overwhelmed by suggestions, nearly all of which had been experimented upon. It was very natural that when a simple apparatus of this kind had been made and tried, and its results analyzed, suggestions which involved altering the process to a great extent could not be carried far. The object of perfecting the invention of Mr. Kidd, which two years ago was in a very crude and imperfect form, had been to make the apparatus produce the best gas it was capable of producing, chiefly with the object of utilizing anthracite coal. There was no doubt that the gas was at present not perfect, but experiments had been made in the direction pointed out, and if they could be carried out on a larger scale he had no doubt better results would be produced. It was very easy to reduce the amount of nitrogen; as, if two or three generators were used, worked alternately, there would be produced, from one or other of them continuously, a gas in which the nitrogen would be reduced to from 12 to 15 per cent.; and the value of the inferior gas allowed to escape from one generator, while the superior gas was being produced in the other, was so small as hardly to affect the cost of the whole. With regard to the suggestion that a greater depth of fuel was necessary, the answer was very simple, that so long as the depth was sufficient to change the carbonic acid into carbonic oxide, leaving only the small amount which the analysis showed, this was all that was required. It had been found by experiment that the depth shown was as nearly as possible the best.

Mr. GORE said that he had had great experience in the generation of water gas, and felt considerable interest in the question. He fully concurred in the great defect of using, for heating purposes, gas in which a large amount of watery vapour was produced. There was another important matter, and that was the large proportion of carbonic oxide. He really thought the poisonous character of that gas, especially when used for domestic purposes, had not been sufficiently considered. His own impression was that the adoption of any system whereby it was to be used for domestic purposes, was so dangerous as to interfere with its practicability. Experiments had lately been going on in America with regard to it, and these pointed to the conclusion that any form of using carbonic oxide must be dangerous, and that, whatever might be done with it for manufacturing purposes, it should be avoided in households. He was convinced that ordinary coal gas was the most useful fuel which could be obtained; but then came the question whether the substitution of gaseous for solid fuel was not a step in the wrong direction.

Mr. KENNELLY, after referring to the statements made by Mr. Davies as to the relative cost of coal gas and that produced by the process he had described, said that if these were true it was nonsense bringing forward theoretical considerations in opposition to them. Whether there were a large amount of nitrogen or a small amount of carbonic acid, if the same effect could be produced from that which cost 3d. as from 10d. worth of ordinary gas—and that seemed to be the result—there was something very valuable in the process. As to the question of danger, he happened to look into a shop in the Strand a short time ago, and saw one of these apparatus at work in the basement. He did not know whether the sanitary authorities or the police were informed of it, but he saw no one looking very unhealthy or unhappy in consequence.

Mr. BRONTIN said that he had had his attention much directed to the question of burning anthracite in an easy form. He believed this was now accomplished, and would direct Mr. Davies's attention to the fact that a very simple apparatus, very much on the principle of the one shown, had been adapted to burn it perfectly, and was applicable to almost any boiler. It consisted in the use of a steam-jet thrown into a hollow bar perforated with holes, through which the steam escaped, and thus formed the gas of which the analysis had been given. It enabled large and small coal to be used, and there was no raking of the fire, or anything of the kind. He had very roughly gone into the question as to the quantity of heat thrown out by the gas, as compared with the ordinary use of coal under a boiler, and he found that the quantity of heat in the case of gas was 627, as against anthracite at 795, so that there would be a disadvantage in the use of coal gas as compared with coal, were it not that he had always found, both in locomotives and under ordinary boilers, there was a large amount of air admitted, which had a considerable cooling effect, so that the absolute result was not obtained from the burning of the coal. He had had a large experience in using gas with blast furnaces, and it was found impossible to do so without having a combustion chamber first, and allowing the products of combustion to pass through that which was required to be heated. The nitrogen would take up a certain amount of heat and carry it with it, and by using a Siemens accumulator it could be utilized to any extent, so as really not to lose any of the elements of heat. Coupling that with the suggestion which had been made as to the conversion of carbonic acid into carbonic oxide again, he thought the process was one which was worthy of very serious attention. He felt quite certain that the march of intellect would lead to the payment of less carriage on coal, because conveying gas would be much more simple.

Mr. HARTLEY said there was a great difference between using gases immediately they were produced and while in a state of incandescence, and in allowing them first to cool and then burning them.

Mr. DAVIES, in reply, said that one speaker had so far answered the remarks of another that there was really very little left for him to say. With regard to the danger of carbonic oxide, it might be said that every gas was dangerous. Marsh gas and olefiant gas were extremely explosive, but there was no fear of admitting them into houses, and, on the same principle, he did not think there was any danger of being poisoned with carbonic oxide. With regard to the great quantity of nitrogen, it only acted as a diluent, and carried off heat. He had shown what could be done with this gas as it stood; he had compared it with coal gas, and the experiments he had mentioned showed that, notwithstanding the nitrogen, a great heating effect could be produced from it, and at a much less cost than with ordinary coal gas.

The CHAIRMAN said there could be no doubt that if the cost of the gas was what had been stated, the system introduced a very important source of economy into domestic arrangements. The advantage of using gas in houses for the purpose of combustion was one of which there could be no doubt, provided the element of cost could be successfully met. A gas fire was so easily regulated, and was so convenient in application, that it certainly appeared to him to be a more civilized arrangement than that of burning raw fuel. No doubt there were certain questions connected with this gas which, if solved, would probably increase its heating power very considerably, but apart from that they might look upon this as a great advance in the system of heating.

A vote of thanks was then passed to Mr. Davies, and the proceedings terminated.

HANLEY SEWAGE FARM.—On the 25th inst., an inquiry was held at the Town Hall, Hanley, before Major Tullbach, of the Local Government Board, with reference to the proposed loan of £25,000, for the conversion of Bradwell Hall Farm into a sewage farm. This step was taken owing to the action of the Duke of Sutherland with regard to the pollution of the River Trent. The Inspector having visited the farm, promised to report at an early date.



## ELECTRIC LIGHTING.

[From *The Times*.]

The advancement of civilization, at least in modern times, might almost be measured by the improvements in artificial light which each recurring period of years has witnessed, and there is now much evidence to show that the public are by no means satisfied with the nocturnal illumination of our streets and houses, and that the time for further progress has arrived or is approaching. A paper on electric lighting was read a short time since before the Society of Arts, and experiments are being made in various localities. Many of our own correspondents have lately called attention to the subject; and, as it is of the highest practical importance, and likely to attract constantly increasing notice, some observations on the primary conditions of this mode of lighting may be not without interest to our readers. It may be said, as a rule, that all artificial light in common use is derived from the incandescence of particles of carbon; and, for ordinary purposes, we derive this carbon from some form of fatty matter or from coal gas. It has long been known, however, that a light of extraordinary brilliancy and power might be obtained by rendering pure carbon incandescent by means of an electric current; and this, the so-called "electric light," has been year by year rendered more manageable. Many chemists and physicists have been occupied in devising means to cheapen or otherwise facilitate its production, and it is now constantly in use in certain lighthouses. Its precise source is that the electric current, in passing from one carbon point to another across a short intervening space, renders both these points incandescent, and the resulting light, with its necessary accompaniment of heat, radiates from the points and from the intervening "electric arc" in every direction. Without entering into unnecessary details, it may be said that the production of this light, even now, is attended by several economical and practical difficulties, and that the attempts which have been made to remove them have as yet been crowned with only partial success. There seems to be no doubt that, when a strong light is wanted at some single point, it can be produced more cheaply by electricity than by common combustion; or, in other words, that a pound of coal converted into heat and made to work a steam-engine, which, in its turn, works an electro-magnet, will produce more light than the same pound of coal converted into gas and burnt in the ordinary way. When a multiple or widely diffused light is wanted, the conditions are somewhat different. If we require 60 or 100 small lights, the use of a small battery or electro-magnet for each will be more costly than gas burning, and, until lately, there has been no means of dividing the current of a large battery between many different points. It was announced not long ago that this difficulty had been overcome; but the announcement, if not inaccurate, might perhaps be fitly described as premature.

The division of a single powerful current was accomplished by a Russian savant, M. Jablochkoff, who also invented what he called an electric candle, to be placed at each one of the many points to which the current might be distributed. This electric candle consists of two carbon pencils placed vertically side by side, in contact at their extreme points, but separated throughout their length by a non-conducting slip of kaolin, or china clay. The weak points of the arrangement are at least two in number. In the ordinary form of electric light, in which the current passes always in the same direction, one of the carbon points is consumed more quickly than the other. This matters nothing where the two are in the same line, and are kept at a stated distance apart by clockwork; but, in the electric candle, the more rapid consumption of one carbon than of the other would soon render the interval between the points too great, so that the current would no longer traverse it, and the light would go out. In order to obviate this result, the Jablochkoff candle can only be used in connexion with an electric machine which furnishes an alternating current, so that both of the points may be consumed equally; and this is less economical than the machines which afford a current passing always in the same direction. The second difficulty is that the candles are liable to go out unexpectedly, either from momentary failure in the current, or from some analogous cause, and that when thus extinguished they cannot be re-lighted. For this purpose it would be necessary to bring the two carbons into momentary contact, and to such contact the kaolin presents an obstacle. The inventor has proved that the division of a current between many lights is practicable, but his success can hardly be said to have gone beyond the limits of a laboratory experiment, and the fall in the value of gas shares, by which the first announcement of the invention of the electric candles was attended, was one among the many instances which show that there may be much fear where there is little danger. The division of the current would be a most important step towards the general employment of an electric light, because it does not appear possible to light up a large space pleasantly from a single point. The rays of the sun do not fall upon visible objects in only a single direction, but in all directions, reflected from the clouds, from the earth, from all surrounding things; and it is this infinite variety of direction which produces a comparative effacement of shadow. A strong electric light, so placed as to illuminate a large area, would fall upon each of the objects therein contained only in one single direction; and it would, therefore, cast shadows of such intense blackness that every spot which was screened from its direct ray would be thrown almost into darkness. Moreover, the direct light from the carbon points is too dazzling to be pleasant, or even safe, to the eyes; and it is scarcely more easy to look at an electric beam than at the sun. The attempt to do so, in either case, is apt to be followed by temporary, or even by permanent, loss of sensibility of the retina; and there have been instances in which blindness has been produced by the use of an imperfectly smoked glass during a solar eclipse.

Our correspondents have recently described some of the attempts which have been made, both in Madrid and in Paris, to utilize electric light for public places. In the existing state of knowledge, a steady and enduring light can only be obtained by having a separate battery for each luminous point, and this arrangement is not economical unless a very large amount of illumination is required. In an open space the carbon points should be enclosed within a globe of the so-called opal or milk-white glass, which diffuses the light evenly from every part of its external surface, and thus much diminishes its intensity. Even the opal globe cannot do away with the blackness of the shadows, nor with a brilliancy which is dazzling, and which, when the eyes are turned away from it to comparative darkness, renders them for a time incapable of seeing. In a large building these inconveniences may be greatly diminished. The light should be suspended near a whitened ceiling, and should have an opaque reflector beneath it, so that the whole of the light may be first directed against the ceiling and the upper parts of the walls, and may then be reflected from them, diffused, softened, and proceeding from many points, to the objects of vision. By this method, which was lately exhibited at a meeting of the Society of Telegraphic Engineers, an almost precise imitation of daylight may be afforded, and the same principle has been successfully applied by Mr. Van der Weyde to photographic portraiture. His pictures by electric light show that his sitters have been able to keep their eyes well open, and he attains a perfection of half-tones which proves how completely the usual density of the shadows has been diminished by the incidence of the rays from different points of the reflecting surface.

On one part of the question a letter which we lately published affords a curious example of the often misleading character of the first impression

made upon the senses. A correspondent described the electric light at Madrid as "a lurid glare, which gives a ghastly appearance to everything near it, and entirely destroys the effect of colour," and it would, perhaps, be difficult to put into language a statement more entirely opposed to the facts. The electric light is, in its composition and qualities, almost undistinguishable from solar light, containing the primary colours—red, green, and blue—in the same proportions, and hence displaying all colours to perfection. It is only when the carbon points are too widely separated that it contains somewhat more blue than solar light; but it differs from this in falling with greater intensity upon any given spot; so that it is dazzling just as a concentration of sunlight would be dazzling, and it modifies the aspect of all the prominent parts of an object by placing them in strong contrast with any neighbouring parts which may be in shadow. It is thus, and thus only, by intensity and by the effects of contrast, that it produces appearances which are different from those seen by ordinary daylight; and these differences, of course, are not inherent in the nature of the illumination, but depend entirely upon the particular manner in which it has hitherto been employed. They will be less conspicuous the more the electric ray, like that of sunlight, can be reflected again and again before it reaches the eyes; and this, at present, can be more readily accomplished in an enclosed space than in the open air, where a reflecting surface of sufficient extent above the light seems hardly attainable. It would probably be possible to light the Albert Hall by electricity to great perfection; and there can be no doubt that, in this case, as in so many others, science will before long remove the difficulties which still stand in the way of a more extended utilization of that artificial sun which the electric beam is calculated to afford.

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The chief feature of interest connected with this district during the past week has been the strike in the Lancashire cotton trade, which, if continued for any lengthened period, will throw a large quantity of the inferior classes of fuel upon the market, and check any advance in the price of slack, which is usually looked forward to during the summer months. Already in many quarters merchants and consumers are stopping supplies of engine fuel, and the closing of many of the iron-works during the past week, for the holidays, has lessened the demand for common coal for forge purposes. For the better classes of round coal, suitable for house fire purposes, there is now very little inquiry, and where pits are working full time, stocks are accumulating. There is a good deal of pushing for orders in all descriptions of fuel, but so far as the generally quoted prices are concerned there is no material change, as colliery proprietors, in the majority of cases, seem determined to put their pits on short time rather than give way to the demands of consumers for further reductions. The average quotations at the pit mouth may be given about as under:—Best Wigan Arley, 9s. to 10s. per ton; common Arley, 7s. 6d. to 8s.; Pemberton four-feet, 7s. 6d. to 8s.; common coal, 5s. 6d. to 6s. 6d.; burgy, 4s. 6d. to 5s.; and good ordinary slack, 3s. to 4s. per ton.

In the gas coal trade there is no material change to notice beyond what I have already reported, the actual amount of business is as yet only small.

The shipping trade shows no improvement, and there is so little doing that shipowners find it extremely difficult to obtain freights.

The necessity of a reduction in miners wages continues to be urged in many quarters, but no general action has yet been proposed.

In the iron trade there has been little or nothing done, and nominally prices are without change. The general tone of the market, however, is weak. Lancashire producers of pig iron would be willing to make concessions on the list prices to secure orders, and in finished iron good specifications could be placed at very low figures.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There were heavy sailings of cargoes of steam and gas coals on Friday, a large fleet of vessels having left the Tyne on that day for the Baltic and Mediterranean. Cronstadt outward rates have advanced fully 20s. per keel. A good many orders are in the market for Constantinople and the Black Sea. Freights for steamers to load gas coals to distant ports are firmer. The quotations are—Alexandria, £18; Constantinople, £15 10s.; Odessa, £16 to £16 10s.; Genoa, £15; Barcelona, £17 per keel. The coasting business from the Tyne and Wear is very quiet and dull. Rates do not change any—London, 4s. 3d.; Havre and Dieppe, 5s. 4d.; and Dublin, 6s. 6d., are the current quotations. The freight to Copenhagen is £5 15s.; and Cronstadt, £8 to £9 per keel. All outward business is firm. There are not many ready steamers in port, and, as soon as they arrive, they are taken up quickly. East India rates have advanced very considerably. The iron market is dull. Pig iron, local make, No. 1, is 48s. 6d.; No. 3, 43s. 6d., net cash. Pig lead is selling from £17 7s. 6d. to £17 10s. per ton. Dry white lead, £24; red lead, £18 15s.; flake litharge, £20 per ton. Copper, flat. Cake and ingot, £68 to £69; best selected, £72 per ton. The chemical market is flat. The manufacturing trade of the Tyne generally is very much distressed. Shipments are poor. A good deal of coke is being sent to Spain by sailing vessels.

## TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Owing to the increasing demands being made upon the Motherwell Gas Company for a supply of gas, it has been resolved to increase the capital by the issue of new shares. In the meantime, 600 additional shares of £1 each are to be allotted to consumers of gas.

In his official examination of the illuminating power of the Glasgow gas during the week ending the 20th of April, Dr. Wallace found that in no instance was the minimum below 26.08 candles, while in the western district it rose to 29.11 candles. The average illuminating power ranged from 26.95 candles to 29.53 candles, and the maximum from 27.33 candles to 30.24 candles.

On the 23rd inst., Glasgow Corporation Gas 9 per Cent. Annuities changed hands at £219, thus making a decline of 10s.

It is not improbable that the Dundee Gas Commissioners will soon be able to reduce the price of gas by at least 3d. per 1000 cubic feet.

The subject of the condition of the gas-pipes in the town of Kelso, which has been already referred to in the JOURNAL, was brought under the notice of the Police Commissioners at a meeting held on the 22nd inst. A short report was submitted by the Paving Committee, followed by a very elaborate and exhaustive report by Mr. John Romans, Gas Engineer, Edinburgh, the gentleman who was called in by the Paving Committee to examine and report upon the mains.

At a meeting of the Works Committee of the Dundee Water Commissioners, held a few days ago, Provost Robertson, the Convener, reported as to the accounts incurred by the Commissioners in the action brought against them by Messrs. Edington and Son with reference to the Lintra then piping. The accounts, as adjusted, included fees of counsel, Edinburgh agents, and witnesses, as well as charges for printing, &c., the total



sum being £4445 13s. 9d. It was agreed to recommend the Commissioners to authorize payment of the accounts. The Provost afterwards stated shortly the effect of the decision of the Court of Session in the claims of the Contractors, as originally made. The sum claimed was £119,873, and the sum allowed by the Lord Ordinary, after the litigation, was £105,954, the sum struck off being £13,919. Previous to the Contractor's action being raised the Commissioners offered, for a settlement of all matters in dispute, £106,654, and the Provost remarked that they might probably have given a little more had the Contractors shown any disposition to arrange amicably. After deducting the expenses incurred by the Commissioners as above stated, and £1200 found due to the Contractors as expenses, the litigation had resulted in a gain to the Commissioners of £8273.

Considerable progress has of late been made with the Dumfermline Corporation Water-Works. All the main-pipes are laid, and the water has been on to the second division for the last four or five weeks. The testing of the pipes has been attended with very satisfactory results, the leakages being chiefly due to defective turning and boring. The cistern at Glassiebarns is all but finished, and the laying of the branch pipes to Milesmarkis begun. The construction of the reservoir is well advanced, the embanking having been formed to the extent of 10,500 yards, in addition to 6000 yards of excavation for the puddle trench, and 9500 yards for the outlet and waste weir channels.

The rainfall at Glencorse (Edinburgh and District Water-Works) from Jan. 1 to April 23, 1876, was 14'35 inches, as against 18'95 inches and 8'80 inches in the corresponding periods of 1877 and 1876 respectively. During the fortnight ending the 23rd inst., the delivery of water in Edinburgh was at the rate of 27'94 gallons per head per day, to a population of 286,000.

As low as 50s. 1d. cash and 50s. 1½d. eight days was paid for pig iron in the Glasgow market last Friday, and the fall in price over the week was 6½d. per ton.

There are no signs of improvement in the coal trade, and buyers seem to be under the impression that lower prices will yet be accepted.

**PURCHASE OF THE DROITWICH GAS-WORKS.**—At the meeting of the Droitwich Town Council on the 16th inst., the Town Clerk stated that he had received the Provisional Order from the Local Government Board with reference to the purchase of the gas-works. They had struck out the clause with reference to the power to borrow £15,000, no sum being now mentioned, and placed the maximum price at which gas could be sold by the Corporation at 8s. per 1000 feet.

**FATAL ACCIDENT TO A GAS MANAGER.**—On Saturday last an inquest was held on the body of Mr. George Smith, Manager of the Henfield Gas-Works, who died on Thursday from dislocation of the neck, caused by falling off a plank while painting the holder. The Jury returned a verdict of "Accidental death." A most distressing fact connected with this accident is that deceased had lost his wife about a year ago, and in consequence five children—the eldest ten years old—are left orphans. Mr. Smith has been connected with the gas-works since they were started.

**BRITON FERRY GAS-WORKS.**—On the 17th ult. a Local Government inquiry was held by Major Tulloch, on the application of the Briton Ferry Local Board, for a loan of £4035 to extend the gas-works. It was supposed that the sum due to the bank could be included in the loan, but this the Inspector said was incorrect, and a rate must be made for the payment of the overdue account of nearly £1000. No one objected to the money being raised, therefore it is expected that ere long great changes will take place at the gas-works.

**BRIDGWATER WATER SUPPLY.**—On Friday last the first sod was cut at the site of a large reservoir at Wemborn, in connection with the water supply for Bridgwater, which is estimated by Mr. Hawksley, the Engineer engaged, to cost about £30,000. The source of supply is at the foot of the Quantock Hills, about eight miles distant, and a large number of workmen are now busily engaged in laying the pipes. Heretofore the only supply of water to the town has been derived from wells. The works are being carried out by the Corporation.

**SWINTON AND MEXBOROUGH GAS COMPANY.**—At the annual meeting of Shareholders, the Directors reported that, notwithstanding a reduction of 3d. per 1000 feet in the price of gas, there had been a favourable year. The amount available for dividend was £1469 7s. 6d. A dividend was declared of 9 per cent. on the first and second issues, and 7 per cent. on the third issue, leaving a balance of £385 18s. 7d., which was carried to the reserve-fund, making the total of that fund £920 2s. Mr. H. Wilson was re-elected Director. Messrs. Harrop and Lockwood complained of the price charged per lamp to the Local Authorities, and the Directors agreed to consider the question.

**DARWEN GAS AND WATER WORKS.**—The Law Clerk to the Local Board, Mr. C. Costeker, has just issued balance-sheets for the year ending the 31st December last, in respect to the above undertakings, both of which were examined and found correct by Mr. Rees, the district Auditor, on the 27th ult. The accounts in respect of the Gas Department show: *Dr.* To balance of net revenue account, £4083 15s. 5½d.; deposits, £322; do. on hired meters, £60 7s. 6d.; amount owing on open accounts, £2101 2s. 1d.; do. Manchester and County Bank, £1363 2s. 2d.; cheque issued but not drawn, £19 18s. 9d.; dividend do., £17 5s. 3d.; balance from sinking-fund account, £705 2s. 6d.: total, £8672 13s. 2½d.—*Cr.* By amount of gas accounts owing, £6514 5s. 7d.; do. meter-rentals owing, £7 18s. 3d.; do. sundry accounts owing, £768 13s. 8d.; stock-in-trade on hand, £1019 6s. 7½d.; balance of cash in hand, £90 0s. 4½d.; balance from capital account, £272 8s. 8½d.: total, £8672 13s. 2½d. The general summary of the Water Works Department is:—*Dr.* To sundry accounts owing, £54 7s.; balance from net revenue account, £421 4s. 8½d.; do. gas department £36 0s. 8d.; do. sinking-fund account, £1020; amount owing Manchester and County Bank, £684 13s. 2d.; cheques issued but not drawn, 5s. 9d.: total £2216 11s. 8½d.—*Cr.* By amount of water accounts owing, £258 6s. 9d.; do. fittings owing, £86 14s. 9½d.; stock on hand, £247 4s. 9½d.; balance from capital account, £1431 18s. 4½d.; cash in bank—interest account, £192 3s. 9d.; cash in hand, 8s. 10d.: total, £2216 11s. 8½d.

**DISCOVERY OF GAS COAL IN NEW ZEALAND.**—The *Invercargill Weekly News* of the 23rd of February writes: "Large deposits of ignitable shale have been for a long time known to exist at Orepuki, and, if we remember rightly, Dr. Hector some two or three years ago reported rather favourably on samples submitted to him for analysis. But New Zealand is so rich in minerals of the kind—there were so many specimens from other places possessing somewhat similar properties—that no particular notice was taken of the report outside the then limited circle of people strongly imbued with faith in the value of the undeveloped resources of the western district. Even they, in the absence of any means for the conveyance of the mineral to market, felt that it would be next to useless to try to do anything in the way of opening out a mine, and so the discovery was allowed to remain unutilized. That it was not, however, lost sight of

altogether is proved by the fact that recently Mr. Henry Hirst, of Orepuki, took the trouble to transmit, through Mr. J. R. Millo, of Riverton, to the Mayor of Invercargill, a case of the shale to be submitted to practical test by Mr. Daley, Gas Engineer. The result of the trial, as stated in that gentleman's report to the Town Council, is even more satisfactory than could have been expected from Dr. Hector's report. Mr. Daley states that for gas-making purposes it is the best sample of coal obtained in the locality he has yet experimented upon, the gas obtained from it surpassing that from grey coal, and being very rich in quality. Its only drawback appears to be that the coke is valueless as a fuel, but against this may be set its superior gas-producing quality. Under the circumstances, every one will agree with Mr. Daley as to the desirability of, as soon as possible, obtaining a sufficient quantity—he suggests two tons—for a further practical test of the shale. How to get it is another matter; to transport that quantity to Riverton would be rather costly in the meantime, as it would have to be either packed on horses all the way, or to the beach at Orepuki, and thence conveyed by boat. Still, expense should not stand in the way of settling a question of so much importance to the district. The absolute certainty of possession of a practically unlimited supply of a mineral in constant demand would certainly afford another reason for pushing on with the railway between Riverton and Orepuki, without which the gas coal, timber, and other resources of the district are of no more use to the colony than money would be to a man on an island of which he was the solitary occupant."

**COAL CLEANSING.**—A lecture on this subject was delivered by Mr. M. Geoffrey Morgans, on the 15th inst., at the Bristol Mining School. The lecturer commenced by remarking that, owing to having made arrangements for the accommodation of other gentlemen whose names were down for lectures, whereby his own now came off two months earlier than expected, he had been unable to complete the prosecution of experiments in two branches of his subject—viz. (1), cleansing by means of centrifugal force, and (2) by means of atmospheric air as a medium for separation—and, consequently, his subject would be more or less limited to cleansing by means of liquid media. He proposed to deal first with the principles affecting the separation of different minerals by combined flotation and gravitation, and next to describe, with the aid of the numerous drawings and photographs exhibited, some of the most modern plant and machinery for carrying out those principles, directing particular attention to some practical details of construction upon which depended in a great measure the successful operation of various continental coal-washing establishments, which are greatly superior to anything at work in this country. Samples of coal, coke, and refuse products were exhibited, as well as specimens of the raw material treated in the various cases. These were the more interesting on account of being accompanied by particulars as to analyses, yields, and working costs. After illustrating the influence of form upon the descent of equivalent weights of the same description of material, the lecturer dwelt upon the importance of sizing coal, and described the best machinery for the purpose, special reference being made to "trommel," in which the various sizes of coal were discharged with the least possible travel and breakage. Of the various cases referred to, one related to an establishment where a quantity of 550 tons of coal is treated per ten-hour shift, in which the ash admixture was reduced from 18 to 3 per cent., at a working cost of 1'4d. per ton of mineral treated. Particulars of the cost of this plant were also given. The lecturer gave a very practical description of machines specially constructed for washing coal dust and slimes, which, until of late, have been discarded. In one case, accumulated slimes from earlier washing operations, containing 25 per cent. of ash, are being successfully cleansed, so as to yield a useful product containing only from 4 to 5 per cent. of ash. A very good coke made from this product was exhibited. Great strides have been made in the successful use of the same water over and over again in coal washing. This is often important where, from the danger of river pollution, it is desirable to prevent the discharge of water holding mineral particles in suspension. In some cases referred to, the escape of effluent water is entirely avoided, and the washed coal is so thoroughly drained of water that the quantity necessary to be added to compensate for loss in this direction (which is the only waste of water incurred) is surprisingly small. Time prevented the lecturer from dealing with the subject of freeing water from minerals in suspension without the aid of settling-tanks. The lecture was concluded by reference to the subject of crushing coal, and its effect upon the quality of coke as seen in various samples exhibited.

## Register of New Patents.

### APPLICATIONS FOR LETTERS PATENT.

- 1589.—ALEXANDER, E. P., Southampton Buildings, London, "Improvements in valve cocks or faucets." A communication. April 20, 1878.  
1591.—HISLOP, G. R., Paisley, and YOUNG, W., Clippens, N.B., "Improvements in revivifying spent lime, and in the means or apparatus therefor." April 20, 1878.  
1604.—LONGSDON, A., Queen Victoria Street, London, "Improvements in apparatus, tools, and machinery, for charging and drawing gas-retorts." April 20, 1878.  
1623.—PINTSCH, J., and SCHÜLKE, J., Berlin, "Improvements in the means and apparatus for kindling and extinguishing or reducing lights by electricity for signalling and other purposes." April 23, 1878.  
1635.—WARNER, W. J., South Shields, Durham, "Improvements in machinery and apparatus for charging and drawing gas-retorts, and for doing the work immediately in connection with them." April 24, 1878.

### PATENT WHICH HAS BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

- 1367.—HARRIES, B., "A new apparatus for gauging the supply of water when used for flushing closets, domestic or other purposes, in order to prevent waste." April 15, 1875.

### PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

- 933.—HOLLINGSHEAD, W., "Improvements in the construction of cone or plug valves." April 10, 1871.  
1036.—SPENCE, D., "Improvements in the treatment of spent oxide of iron arising from the purification of gas, or the said oxide when partly spent." April 19, 1871.



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## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

W. C. writes that the paragraph in our last issue (page 686) relative to a Local Government Board Inquiry at Briton Ferry, upon an application of the Local Board to borrow £4035 for gas-works extensions, is incorrect in stating that "it was supposed that the sum due to the bank could be included in the loan." Our correspondent says, "such a thing was never thought of." Several interesting facts in our correspondent's letter will have attention hereafter.

G. WEBSTER, Nottingham.—Received, and shall have attention.

R. O. P., Cheltenham.—Your letter, which did not reach us till Monday morning, necessarily stands over till next week.

T. T., West Hartlepool.—Thanks; we are glad of the information, and shall publish it in due course.

## THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 7, 1878.

## Circular to Gas Companies.

It is an axiom in physics that large bodies move slowly. We are, therefore, not surprised that the Corporation of the City of London are making but small progress with the scheme for a complete Municipal Organization for the whole of the Metropolis. We care nothing about the authorship of the scheme, or its exact details; it is sufficient for us to know that a plan is under consideration at Guildhall, which promises to accomplish the results we desire so much to see achieved. The present time of the year brings to Committees a large amount of general business which must be cleared off; but when Members come back from their summer holidays, "like giants refreshed with new wine," we may expect that some advance will be made in the constitution of a Metropolitan Municipality. We need not here again remark upon the importance it will have to Metropolitan Gas Companies. It is sufficient for us to say that serious consideration is being given to the formation of a Metropolitan Municipality which may possibly swallow up the Gas Companies. A word to the wise is all we need add.

Last night an experiment with the electric light was to have been made in the open space facing the Mansion House. At this moment we do not know whether any experiment has been made, or, if it has, what result has been obtained. Our readers know perfectly well that we entertain no objection to the employment of electricity for the public illumination of open places.

In the instance now under notice we are not informed where the boiler and the dynamo-electric machine are to be placed. They may be located very properly in the kitchen of the Mansion House, the space of which will be better occupied than in the warming up of viands from Ring and Brymer's for the refectory of hungry Common Councilmen. Next week we may, perhaps, have the opportunity of stating our opinion as to the result of the experiments made. To-day we have to observe reticence, not because we have much doubt about the matter, but because we wish only to report upon actual effects. We understand that the lantern is to be placed on the roof of the Mansion House, and we can easily comprehend the effects that will be produced. The *façade* of the Royal Exchange will be brilliantly illuminated, so also will the clock dial at the Globe Insurance Office; but the purblind wayfarers will run more risk than ever of being knocked down by omnibuses and Hansom cabs, as they attempt to make way over the dangerous crossings in this locality. We notice that certain contemporaries still talk about the generation of electricity by a moist battery. It is now over forty years since Liebig showed the absurdity of supposing that electricity generated in that way could possibly compete with gas, or, indeed, any other artificial mode of illumination then in use. We have now, however, a power which has entirely superseded the moist battery, and, so far, it may be said that we have a new antagonist to face. But we are not in the least afraid of it. It may light the open space in front of the Mansion House, and a dozen other spaces, which badly want better illumination, but every one will rejoice that the strongholds of the Gas Companies will still be safe. It must be very many years indeed, if it should ever occur, before electricity will be so distributed as to illuminate small areas with economy and comfort.

We have reason to believe that an attempt will shortly be made to introduce into this Metropolis what is known in New York, and other cities of the United States, as the Lowe system of gas-making. The process consists really in the manufacture of water gas, which is carburetted by means which have been more than once described in our columns. To-day we publish a report by Professor Würtz, on a gas of this description, and supplied by the Municipal Company in New York. The gas is undoubtedly of rich quality, being set down in the report, to which we alluded last week, as equal to twenty-two standard candles, while the price compares favourably with that of other Companies supplying New York with gas of inferior power. We doubt whether carburetted gas will succeed to any great extent in this country. Coal is cheap here, just as petroleum is in America, and low as the price of the carburetting material now is, it would soon be doubled by an increased demand. We do not look, therefore, to this novelty for any great advantage. It has undoubted merits, but is not exactly suited to our use. We have an abundance of cheap coal, which will last us for centuries, and we do not in the least expect to see the coal gas industry superseded, or even disturbed by these inventions.

The Town Council of Wigan, at a recent quarterly meeting, passed a resolution which practically absolves their Gas Committee from all blame in connection with the non-publication of the gas accounts. Seeing that the Committee have now resolved to comply with the law, we have nothing further to say but this: When writing last week of the general Acts of 1847 and 1871, we forgot, for the moment, the Consolidating Bill which is now before Parliament. On referring to this, we again find no distinction made between Companies and Corporations, but the provision is continued which makes it compulsory on all "undertakers" to furnish accounts in a form prescribed in a schedule. A certain latitude, as regards the form, is allowed, and this, we may take it, is a concession to Corporations, who need not supply some particulars which are stringently required from Companies.

The Leicester Corporation have just appointed Committees to manage their gas and water undertakings. Practising "self-denial," as a member of the Corporation put it, they have limited the number of members on each Committee to thirteen, with, as a matter of course, the Mayor as an *ex-officio* member. We hardly understand the desire of so many gentlemen to serve on these Committees. They cannot be required, for if only half the number would really devote themselves to the business, it might be carried on with ease and regularity. What special inducement there is to become a Gas Committeeman, and why Town Councillors should be required to exercise "self-denial" in order to keep off the Committee, we do not understand. Vanity will, of course, induce men to undertake any amount of work, and we do not suppose that any substantial advantages can be derived from serving on the Gas Committee of the Corporation of Leicester. The number of members, however, does look to us excessive. Fifteen gentlemen manage the whole



business of the Chartered Gas Company, supplying more than half the Metropolis, with the utmost success.

The gas accounts of the Corporation of Rochdale have been recently issued, and show a very healthy state of affairs. The net profits appear to amount to £8622, but we are not told what is to be done with this surplus. The gas consumers of Rochdale and Leicester must wake up, or they will find themselves over-taxed. It is true that the Corporation of Rochdale have reduced the price of gas, but it is quite clear that it might be cheaper. Very favourable coal contracts, and, considering the times, a very fair sale for coke, should enable the Corporation to bring down the price of gas to a lower figure than at present. The sum realized for tar and ammoniacal liquor is too small, but we understand that the Corporation have a low contract, which is fast running out. Better prices will probably soon be obtained, and the consumers will then have another chance of a reduction.

A certain section of the inhabitants of Rotherham are dissatisfied with the present situation of the gas-works, and wish to have new ones erected on a more convenient site, and further removed from the centre of the town. A large majority of the Town Council have fallen in with this view of the case, and in all probability application will be made to Parliament next year for power to acquire another site, and to raise money for the construction of new works. The Rotherham undertaking, obtained under peculiar circumstances very much resembling compulsory purchase, has not, we believe, been particularly profitable to the Corporation; and, now that it is found necessary to erect new works, an additional load will be thrown upon the shoulders of the ratepayers. It is expected that the money brought by the sale of the site of the present works will do much to recoup the Corporation for the additional expenditure.

The Directors of the Hastings Gas Company have written a very polite letter to the Gas Consumers Association, showing the reasons why they cannot at the present moment reduce the price of gas. They point out the differences between the conditions of the supply of gas at Brighton and Hastings, and show how much more favourably the two Companies in the former place are situated. It was hardly necessary, we think, to take all this trouble, for every visitor to these two places, interested in gas-works, must see and know at once that gas could not be cheap at Hastings. As a matter of fact, we find the inhabitants do not much complain of the price. They would, of course, like to have gas cheaper, just as they would like to have butchers meat at a more reasonable price, but loud complaints we never met with. The Directors of the Company have now given their opponents an assurance that as soon as the just rights of their Shareholders permit, the price of gas will be lowered. Let the consumers be content with this. They have honourable men to deal with, and the promise made is certain to be kept.

The Brighton Corporation are about to make an effort to acquire the two gas undertakings which supply their limits. At the present moment, we believe, no negotiations have been entered upon, but between now and next November communications will be exchanged, and *pour-parlers* will take place, which are not unlikely to result, in the end, in the transference of the undertakings to the Corporation. We imagine that nothing like a compulsory purchase will be attempted. The Brighton undertakings are too valuable to be parted with on easy terms. Their market value would be very high, and perhaps when the Corporation come to consider the price they will have to pay, they may alter their minds as to the desirability of making the purchase.

The final meeting of the session 1877-78 of the North of England Association of Gas Managers was opened with an able address by Mr. W. J. Warner, of Shields. We are not inclined altogether to agree, however, with what the President said about papers and discussions. No doubt the preparation of a paper is a very useful exercise for a Manager; but Gas Engineers are not schoolboys. We expect them to bring to these meetings the results of experience—realized knowledge, as we may call it; and more of this may be conveyed in discussions than in a formal paper. In fact, the paper should be little more than a text upon which many members might preach. We are far from depreciating the practice of writing well-prepared essays, but the time Managers can give to these meetings is so extremely short, that long papers become a serious inconvenience. With all Mr. Warner says about the propriety of Gas Companies having a control over gas-fittings, we perfectly agree. It is due no less to the Consumer than to the Company, that supervision should be exercised, so that the one may obtain the utmost benefit from what he buys, and the other the greatest profit upon what he sells. Bad fittings and small pipes are the curses of the day. We do not speak of the artistic work, in which there is

still much room for improvement, but of the actual means of distribution and consumption. Many improvements, however, may be expected as the knowledge of gas and its uses are made better known, at the exhibitions of which Mr. Warner was one of the first originators. The account of the electric light, given by Mr. Ford, of Stockton, is of much interest, for it shows how little gas has to fear from the competition of the new illuminant. It seems that in workshops, at all events, the two lights must be employed in conjunction; but then the use of the two lights together is very trying to the workman, whose eyes are at one moment dazzled by a brilliant glare, and at the next plunged into semi-darkness. At the last moment we find that we must defer publishing our report of the proceedings at the meeting, owing to the absence of one of the papers.

### Water and Sanitary Notes.

WE are very much surprised to hear that opposition to the Thirlmere scheme of the Manchester Corporation is to be carried to the House of Lords. We venture to predict that nothing will be gained by this action. The Report of the Commons Committee was so cogent and conclusive, that we have no fear that the decision arrived at will be reversed, or in the least interfered with. We presume that the opponents have still money in hand, and that they are anxious to expend it.

It would seem that an "informal" proposal has been made to Liverpool by the Corporation of Manchester, with a view to the disposal of some of the surplus water from Thirlmere to the former city. For some years to come Manchester will only require ten million gallons per day from that source, and power has been obtained to take fifty millions. Here, then, is a very large surplus which is available for the supply of many places, Liverpool among them. The proposal, it appears, does not find favour in the eyes of the Liverpool Water Committee, who seem bent on having a grand scheme of their own. It may be estimated that the wants of Liverpool will, in time, be very large, and may justify the Committee in going to an entirely independent source. An association with Manchester might, perhaps, stave off the difficulty for a quarter of a century; but then a pinch might come, and possibly it would be better to secure a full and independent supply by one outlay.

The Stockton and Middlesbrough Corporations have now ascertained the total cost of the water undertaking which they happily succeeded in purchasing. It stands as follows:—

Twenty-five years purchase of statutory dividends . . . . .	£466,175
Mr. Higgins's award . . . . .	213,802
Statutory and other debts . . . . .	110,000
Total . . . . .	£789,977

This, however, is by no means the whole cost, for various items, including the cost of arbitration, will bring up the amount to be paid by the Corporation to at least £850,000. As we have mentioned before, expense will not end here, for the Corporations are bound to go to the Balder and the Lune for a new and purer supply. When this supply is furnished, the ratepayers will know the full extent of their liabilities, and will probably for ever regret the day they entered upon the campaign against the Stockton and Middlesbrough Water Company. They might have had the works for little more than two-thirds of the money; but the Corporations would not come to terms with the Company. They made up their minds to carry things with a high hand, and they succeeded, and now have to pay the cost. The joint Water Board have sent precepts to the two Town Councils to pay forthwith their moiety of the purchase-money (£400,000), and the Councils are naturally exercised as to where it is to come from. The story of this purchase is very remarkable, and deserves the serious attention of all authorities who seek to acquire a Naboth's vineyard in the shape of gas and water undertakings. We have not space in our present number for the report of the Water Board, which is a very instructive document, and worthy the attention of ambitious Local Authorities in general, but shall publish it in our next.

**HADLEIGH GAS COMPANY.**—The report of the Directors shows that the profits for the year 1877 enable them to recommend a dividend at the rate of 7 per cent., and carry a balance to the reserve-fund.

**SHOREHAM WATER-WORKS COMPANY.**—The half yearly meeting of Shareholders was held at Brighton on the 27th ult.—Mr. W. Hall in the chair. The report of the Directors showed that there was a balance available for dividend of £267 9s. 7d., and they recommended the payment of a dividend of 2½ per cent., making, with the 3 per cent. declared in October last, 5½ per cent. for the year, carrying the sum of £30 to the reserve-fund, and leaving a balance of £49 19s. 7d. Additional services had been laid during the half year, producing an annual rental of about £85. The Directors stated that they were in negotiation with the owners of the Aldington Estate or the extension of the Company's mains to that district.



# A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLXIV.

PUBLIC LIGHTING (continued).

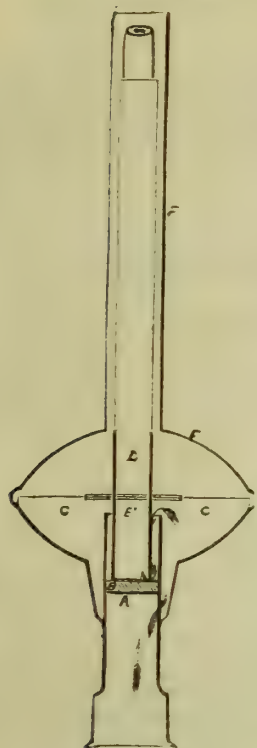


FIG. 45.

The apparatus shown in fig. 45, is the invention of Mr. W. Smith, and has the merit of simplicity to recommend it. The inlet-pipe, A, has a small cup, B, formed within it, containing mercury to seal the end of the burner-tube, D. This latter is secured to a flexible diaphragm, forming, with the body of the instrument, a chamber, C. The gas flows into this chamber through an orifice in the side of the inlet-pipe. F is a cover capable of being easily removed, standing a little above the top of the burner, to protect a small constant jet thereon from being extinguished. The gas for the supply of the constant jet is admitted through a hole, E, in the side of the burner-tube. The weight of the latter is so adjusted that, with the ordinary day pressure, the end of the tube remains immersed in the mercury, and the passage for the gas is consequently sealed; but as soon as the night pressure is put on, the diaphragm is raised, and the tube lifted clear of the mercury, admitting the gas to the burner in full force.

In looking at the apparatus, the principal objection that suggests itself is the difficulty of keeping the small hole, for the supply of the constant flame, clear of obstruction; and the jet itself will be extremely liable to extinction, owing to the limited quantity of gas supporting it, issuing

from a comparatively large orifice. Altogether, the arrangement, though scarcely such as to ensure certainty of action when applied on an extended scale, suggests the possibility of achieving the end in view.

The automatic lighter, fig. 46, patented by Mr. W. A. Hunter in 1869, works by hydraulic power, and by one operation opens the stopcock, strikes a match, and lights the gas. A water service-pipe

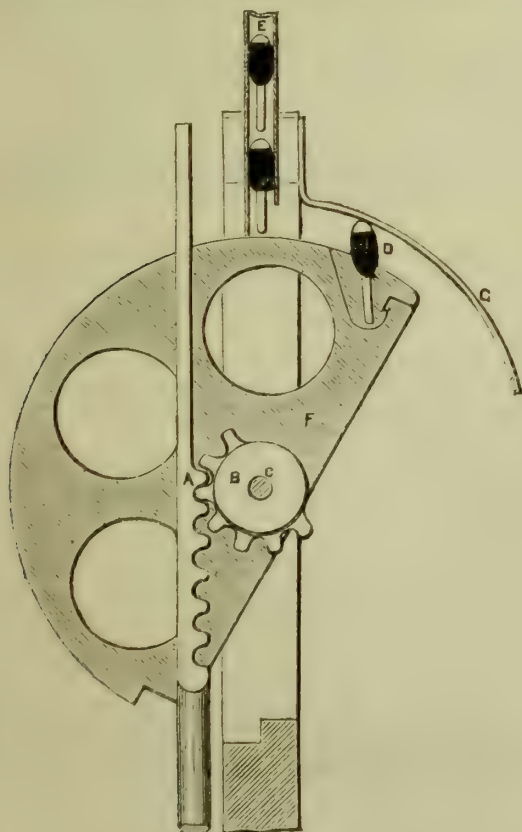


FIG. 46.

is laid from lamp to lamp, and the necessary pressure is supplied by a tank placed at the proper elevation. Inside each lamp-post a small cylinder is fixed, to the piston of which a rod, A, is attached. The top of this rod is formed as a rack, gearing into a wheel, B, toothed for about three-fourths of its circumference, and attached to the lamp-cock, C, which is turned round, opening and closing the cock as the rod rises and falls. A swivel plate, F, forming a half disc, is secured to the plug, and turns with it. Over this is a case, E, containing a week's supply of matches or fuses; these drop, one at a time as

required, into a recess in the plate, and in being carried round therewith are rubbed against the roughened surface of a spring, G, and thus ignited light the gas and drop to the bottom of the lantern. To extinguish the light, the water pressure is taken off, by opening an escape tap, when the piston fall by its own gravity, bringing down the rod, and closing the lamp-cock.

Another instrument, patented about the same time by Messrs. Stephenson, Bartholomew, and King, was operated by pneumatic power in a similar manner, but failed, principally in consequence of the taps becoming stiff, so that the power applied was insufficient to move them.

The pneumatic lamplighter next illustrated in fig. 47 is the invention of Mr. Foulis. This represents the apparatus two-thirds of the actual size, which, as will be seen, is less in bulk than most lamp regulators, for which it also acts as a substitute.

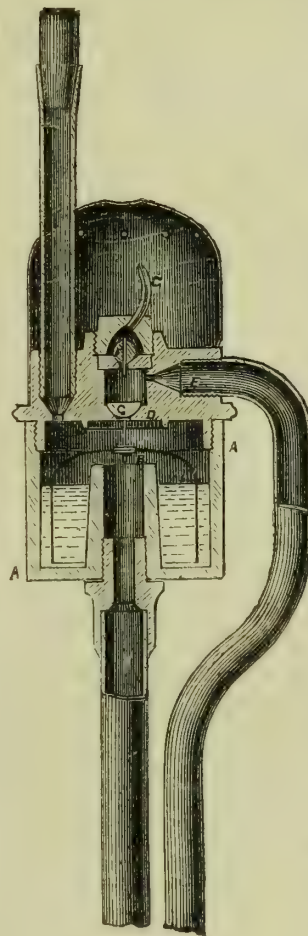


FIG. 47.

It consists of a cylindrical vessel, A, filled to about half its depth with glycerine. In this vessel there is a bell, B, dipping into the glycerine. Attached to the top, by means of a wire, is the valve, C, resting on its seat, D. The gas enters by the pipe, E, above the valve-seat, D. There is a smaller valve, F, immediately above the valve, C, communicating with the jet, G. This valve has an opening through it just sufficient to keep the jet lighted with a very small flame. Through the bottom of the vessel, A, a tube is passed, which rises into the interior of the bell, B. This tube communicates with a small air-holder placed in a lamp-post or other convenient position, on which the pressure may be increased or diminished at pleasure, and the holder may control any number of lamps.

It will be seen that pressure put on this holder will be communicated to the interior of the bell, B, which will rise, and thereby open the valve, C, until the pressure on the top of the bell, and consequently the pressure of gas passing to the burner, is equal to the air pressure in the interior of the bell, less the pressure due to the weight of the latter.

The pressure of the lamps in a district or town may thus be controlled from one central point, independently of the pressure in the mains, or irregularity of levels, in the district.

The action of the instrument as a lamplighter is as follows:—The small jet, G, is kept lighted by the gas passing through the orifice in the valve, F. In order to light the lamps, a pressure slightly greater than the gas pressure in the main is put on the interior of the bell, B, by means of the air-holder. The bell will then rise and allow the gas to pass to the burner; and it will continue to rise until the valve, C, touches the small valve, F, and, opening it, allows a larger quantity of gas to pass to the jet, G, which lengthens out until it comes in contact with the gas issuing from the main burner, and ignites it. The air pressure is then reduced to what is required for the large burner; the bell, B, and valve, C, fall slightly, which allows the valve, F, to drop into its seat, thereby reducing the small jet to its normal size; at the same time regulating the flow of gas to the main burner. In order to put out the light, the pressure is reduced in the air-pipe, and the valve, C, closes. The small jet, G, is protected by a wind-guard.

Mr. Foulis has had some of these lighters in use for several months, and they have not once failed in their action.

**CAUSES OF GAS EXPLOSIONS.**—Public attention has lately been called to some very serious accidents resulting from escapes of gas. It is well known that one fruitful source of gas escape is the water-joint pendant. This old apparatus, as a gas manager very properly says, is ill-understood by the bulk of gas consumers, who seem to forget that water will evaporate, and very quickly too, in a heated room, so allowing the gas to escape in such quantity as to cause a serious explosion in a very short time. The evaporation of the water in the pendant, and the risk of accident arising therefrom, may be prevented by adopting the following simple and effectual remedy:—Fill with water the water-cup at the top of the outer tube of the pendant to within an inch or two of the top; fill up the remainder with rape or sweet oil, and the pendant will then be safe, and require no attention in this respect for a lifetime. Pendants, if drawn down during the evening, should always be pushed up again before retiring for the night. Another sufferer believes that many of the accidents result from the continued use of pewter pipe, or "tripe," which is very cheap, compared with proper tin pipe, or proper iron tube, and which should on no account be used. This cheap pipe on being bent readily cracks, as it has not the tenacity of good tin pipe, and it can be pierced by a tin-tack. It melts at the low temperature of solder, and if there is a fire it opens at once a way for the gas to burn. The gas-fitters, to do their work quickly, join by a soldered joint any required branches, instead of putting in brass connecting pieces as T's and unions, and cracks frequently occur at these cheaply-made connections.—*Sanitary Record.*



## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

## THE EFFECT OF NITROGEN ON THE TEMPERATURE OF COMBUSTION.

SIR,—I was much surprised at a statement made by Sir Francis Knowles, at the meeting of the Society of Arts reported in your issue of April 30. It is stated by him that "if to boiling water was added an equal quantity of cold water, there would be obtained a heat much below the mean of the two temperatures," and he argues that, therefore, "the mixture of nitrogen with an inflammable gas must much deteriorate the value of the gas as fuel."

This statement is erroneous both in fact and in reasoning.

As a matter of fact, the temperature of a mixture of equal quantities of boiling and cold water is, practically, the mean of the two temperatures of the waters before mixing. I say practically, for there is a minute difference, arising from the fact that the specific heat of boiling water is about one-half per cent. higher than that of cold water. The result of this difference would be to make the heat of the mixture to a very small extent higher, instead of being lower than the mean.

Next, even if the statement of Sir F. Knowles were true with regard to liquids, it by no means follows that it would be true with regard to gases. Indeed, the laws of the specific heats of the former differ widely from those affecting the latter. All the simple gases and carbonic oxide have, for equal volumes, very nearly the same specific heat, and most of the other gases differ but slightly from this measure. Their specific heats are, therefore, inversely as their specific gravities. On the other hand, the capacity for heat of liquids varies very widely. For example, 1 lb. of water holds 30 times as much heat as 1 lb. of mercury at the same temperature. The capacity for heat of equal volumes (sometimes called the relative heat) is the product of the specific heat by specific gravity; and as mercury is 13.6 times heavier than water, its relative heat,  $13.6 \times .033$ , is only 0.4488 that of water. Again, the specific heat of ether is only .53, which, multiplied by its specific gravity, 0.715, gives its relative heat, 0.379, or little over one-third that of water. These examples show how erroneous any deductions must be which are based on the presumption that gases follow the same laws as liquids.

When we speak of the value of a fuel, we generally mean the quantity of heat developed by its combustion, and not the degree of temperature to which the products are raised; and in the case referred to by Sir F. Knowles, the quantity of heat, notwithstanding the mixture with nitrogen, is precisely the same as if no nitrogen had been present; for if there be a lower degree of temperature, there is a larger mass heated. If a glass of whisky be put in a tumbler, there will be the same quantity of alcohol for the consumer, whether he drinks it neat or dilutes it down to "sixteen-water grog." The effects on the palate will be different, but the quantity of spirit taken into the system will be the same. In the same way, the nitrogen lowers the degree, but does not diminish the quantity, of heat. In the burning of anthracite coal, it is usual to admit a jet of steam below the bars of boiler furnaces, in order to dilute and extend the heat through the flues, otherwise the fire-box might be burned, while the ends of the flues would be cold. Of course, for certain purposes a very high degree of heat is necessary—for instance, in gas-making and many metallurgical operations; but, for most purposes, the temperature resulting from the combustion of the gas produced by Mr. Kidd's process would be amply sufficient.

About the process itself, its originality or economy, I do not know enough to form an opinion; but, so far as I can understand the apparatus without having seen any drawings, I believe that the mode of supplying steam and air can be greatly improved, and the supply of each more effectually regulated. I think, also, that it will be hard to improve much on Mr. Siemens's principle. If the fuel be completely burned, and all the heat usefully taken from the products of combustion before they escape, nothing more can be done. The only loss I can see in Siemens's gas producers is the cooling of the gas between the producer and the furnace—a cooling rendered necessary to induce the draught employed in that system, and perhaps a slight modification of the apparatus might enable us to dispense with this cooling process.

In making these remarks, I have no desire to depreciate, neither have I any wish to extol, Mr. Kidd's invention. My sole object is to remove a misapprehension which may mislead others. Indeed, I have more than once been surprised at the mistakes which practical men have made from confusing the degree of temperature with the quantity of heat, and as it is a matter of the greatest importance to gas engineers, I trust they will pardon me for calling attention to the subject.

Cork, May 2, 1878.

DENNY LANE.

## THE REMOVAL OF SULPHUR COMPOUNDS.

SIR,—You noticed in your last JOURNAL (April 30th) a promised new solution of the sulphur difficulty, by introducing into the hydraulic main a stream of ammonia. You may, perhaps, be pleased to learn that the idea is not new to us, but that we know the value of introducing to the hot gas in the hydraulic main a stream of strong purified ammonia, either in the vapour form or solution. In the year 1875 we began experimenting in this direction, and sent our first stream of ammonia into the hydraulic main, the results proving so satisfactory, both with regard to illuminating power, purification, and the absence of naphthalene, that we have continued the process to the present time. Our plan is very simple, and, after using the ammonia as often as we wish, to absorb from the gas the impurities it contains, we ultimately recover the whole of the ammonia in the form of sulphate of ammonia.

Lewes, May 3, 1878.

JOHN HAMMOND.

## WANTED, A RULE.

SIR,—In your issue of the 9th of April your correspondent, "Q," asks for a rule for determining the yield of gas from ordinary coal, when a certain candle power is required.

The following simple rule will solve all such cases: Multiply the yield of gas per ton by the candle power of the same, and the product will give the yield in candle feet per ton. Divide the candle feet by the

candle power required, and the quotient will give the yield per ton in cubic feet.

Example: If one ton of coal will produce 9500 cubic feet of 14-candle gas, what will the same coal yield when a 12, 13, 14, 15, or 16 candle gas is required?

Hence  $9,500 \times 14 = 133,000$  candle feet per ton.

For 12-candle gas	$\frac{133,000}{12}$	= 11,083 cubic feet of gas per ton.
13 "	$\frac{133,000}{13}$	= 10,230 " "
14 "	$\frac{133,000}{14}$	= 9,500 " "
15 "	$\frac{133,000}{15}$	= 8,866 " "
16 "	$\frac{133,000}{16}$	= 8,312 " "

If he would prefer to make his calculations by the pound of coal, he must proceed as follows:—

$$\frac{9500}{2240} = 4.24 \text{ cubic feet per pound.}$$

Hence  $4.24 \times 14 = 59.36$  candle feet per pound.

For 12-candle gas	$\frac{59.36}{12}$	= 4.94 cubic feet per pound.
13 "	$\frac{59.36}{13}$	= 4.56 " "
14 "	$\frac{59.36}{14}$	= 4.24 " "
15 "	$\frac{59.36}{15}$	= 3.95 " "
16 "	$\frac{59.36}{16}$	= 3.71 " "

As we cannot get a 25-candle gas from Newcastle coal when made by the ordinary process, we must not apply this rule to extreme cases. Nevertheless, we can make a 25-candle gas from that coal, by using a more complicated process than that now used, if required.

Your correspondent may find more particulars relating to this subject by referring to Vol. XXVIII., p. 93, of your JOURNAL. WM. FARMER.  
New York, April 20, 1878.

## HOW NOT TO DO IT.

SIR,—I wish to make known to your readers a difficulty which occurred in my experience as to a supply of gas, and I should much like to know how redress could be obtained in such a case. It was this: A small house situated 80 yards from the main wanted a supply of gas—seven or eight lights, perhaps—and, on applying to the Gas Company, the Manager refused to lay down a service-pipe, on the ground of expense, although the house referred to was the first of a row of five or six houses, all of which would no doubt have taken gas. I offered to pay half the cost of the service, which was declined. I then offered to pay for the pipes for the whole 80 yards, which was again refused, I believe, on the ground that there was no place to fix a meter at the commencement of the service-pipe next the main. After this I ceased to wonder what had made this Company the most unpopular Company in the district. I should mention that the price charged for gas is 5s. per 1000.

ENGINEER.

SIR,—I am one of those "Country Gas Managers" who have recently been called upon to supply gas to premises, not 25, but 300 yards from our nearest main. I do not now write to you so much to complain of that, as to offer a few remarks upon Mr. Livesey's letter in your JOURNAL of this week.

In reference to the operation of the 11th clause of the Act of 1871, I should like to ask whether, in the event of the forecourt, garden, or open space, being just within the 75 feet, the Company could not insist upon the meter being placed at that point, and not, perhaps, at 300 yards further distance, or even more, up a coach-road, or through gardens leading up to a residence, where, as is often the case, only the servants apartments and passages are to be supplied with gas?

I conceive that this will make all the difference. "Country Managers" are not always, or even often, alarmed at the expense of 30 feet of service-pipe—which, by the by, will cost more than Mr. Livesey states, if of proper capacity; and the greater the distance, the greater the need of ample diameter of service-pipe—but, at the probable prospective loss through leakage, &c., which is sure to arise at some time; or whence the "Unaccounted-for" gas which we all have to chronicle? To be plain, I will illustrate what I mean. Suppose a gentleman, having a villa residence, or "hunting box," approached by a carriage road a mile long—and there are many of them—and the entrance gate of the carriage road is within 75 feet of the Company's main, I take it that such owner or occupier is entitled, under Clause 11 of the 1871 Act, to call upon the Company to supply his house with gas, even though only for the domestic apartments and passages, and yielding a revenue of, say, £15 a year, he agreeing to pay all cost beyond the entrance gate. I do not think his title can be disputed; but, surely, the Legislature never contemplated that the Company should be required to lay for such a purpose—even at the cost of the applicant—a mile of pipe before the meter was fixed. I cannot help thinking that the Company might insist upon fixing the meter at the point where their gratuitous duties cease—viz., 25 yards from their main.

I should like Mr. Livesey to clear up this point.

In my own case, right or wrong, I am insisting upon it, notwithstanding it is a Government application, and the property is contiguous to our main. For their convenience they wished the meter placed at a specified point—300 yards from the main—and they will even bear the whole of the expense; but I reply, "For our security you must place it



at a point 25 yards from our main," and, not to be mean, we offer to lay beyond the meter a further 25 yards of 3-inch main gratuitously.

There are several towns I know in which small villas, rented at from £20 to £80 a year, are being built in their own grounds, and the Companies, small and poor, would feel the cost to be serious, even if only £1 or £2, to carry services to these villas, which, possibly, may only be used a few weeks in the year, in the summer season, so that it is utterly impossible the consumption would repay the outlay.

Undoubtedly, for every additional 10,000 feet of gas sold, we have to carbonize more coal, pay more wages, and, sooner or later, put up more retorts and gasholders; or does Mr. Livesey imagine that all increase of gas-rental is so much net profit?

If such were not so, why the perpetual extension of gas-works throughout the whole country? If many half-yearly accounts show an increased rental and a diminished expenditure for coal, that may arise—as Mr. Livesey knows—from several causes, perhaps from improved manufacturing and distributing plant—it may be from lower coal contracts; but suppose you are up to the mark in these matters, then surely increased demand means increased supply, and that means—soon enough in some cases, and ultimately in all—increased charges on every head of expenditure, capital account included.

I think the experience of every Metropolitan and Country Manager will bear me out in this matter.

My remarks on Mr. Livesey's letter are in no way unfriendly, for, knowing him as I do, I yield to no man in my high regard for him, and my estimation of the many and good services he has rendered by his readiness to supply any information or explanation likely to be of use to Gas Managers.

Weymouth, May 2, 1878.

THOMAS STONE.

## Parliamentary Intelligence.

### HOUSE OF COMMONS COMMITTEE.

WEDNESDAY, MARCH 13.

(Before the Marquis of LORNE, Chairman; Mr. STARKEY, and Mr. ERNEST NOEL; Sir JOHN DUCKWORTH, Referee.)

#### CHELTHAM WATER BILL.

#### CHELTHAM CORPORATION WATER BILL.

(Continued from p. 677.)

Dr. Wilson was recalled and cross-examined. He said: I have frequently got rid of diarrhoea in a house by simply directing my patients to change their water. They were in the habit of using well water, and I told them to use the Company's water. I certainly do not approve of supplying Cheltenham from the sand. It is my opinion that a navigable river should not be chosen as the source of water supply for drinking purposes, when any other source is available. I cannot say that this opinion is founded upon any particular statistics, but it is the result of my reading and observation. There are several populous towns in the basin of the Severn above Worcester; but I have not studied the health statistics of Worcester. I do not know that Wolverhampton, Walsall, Dudley, and other towns drain into the Teme, or that before 1854 the sole supply of water for Birmingham was obtained from that river. I do not know that cholera was extremely violent in the Black Country in 1854, and that not a single case of cholera originated in Birmingham. Without knowing all the factors in the case, I cannot give any explanation of the figures in the Registrar-General's report, which show that while in 1849 the deaths from cholera in Wolverhampton were 1365, the deaths in Birmingham, lower down the river, were only 29. I am not aware that cholera always ascends a river instead of descending, though I know it sometimes does.

Dr. Wright, Medical Officer of Health for Cheltenham, said: I have resided in Cheltenham since 1842, and for many years was senior surgeon of the hospital. I have a considerable stake as a Shareholder in the Water Company. The poorer parts of the town depend almost entirely on wells, and that supply is very unsatisfactory; but the Company cannot be blamed for this, as they have no mains there. There have been applications to the Company to supply the poorer parts. There have been cases of fever arising from the want of a proper water supply to the poorer cottages. Upwards of 3000 houses are rated under £10 per annum in the district; 368 of these are supplied by the Company. There was no main in the North Ward until about last April. Since the Corporation have taken action, the Company have been very active in laying down mains in the town. Some time ago a conference took place between the Company and the Public Health Committee of the Town Council. I was asked to point out which district most required additional mains, and I indicated the Sherborne Street district, because I had had my attention called to several cases there of typhoid fever arising from the water, and because it would have been possible to supply that district with a constant service without interfering with the intermittent system of the town. I have no hesitation in saying that no Sanitary Authority can possibly carry out the Public Health Act who do not hold command of the water supply in their own hands. Besides the ordinary sewage, there is a considerable number of dead bodies of animals floating about on the surface of the Severn. The ova of the entozoa from the dead cats and dogs are therefore likely to get into the human system if the water is drunk. I certainly do not think that the Severn water ought to be sanctioned for a place like Cheltenham. The feeling upon this subject in the town in 1865 was something remarkable. The aristocracy of the town are unanimously opposed to the introduction of Severn water. Apart from the sanitary point of view, the very thought of drinking the contents of an impure river is repugnant to their feelings. However unreasonable that aversion might be, if it drove people away it would be injurious to the prosperity of the place. Everything has been done, on the part of the Water Committee of the Town Council, that could be done to come to terms with the Company. I consider that the conduct of the Directors has been most arbitrary. All the Shareholders who have spoken to me on the subject would be very glad indeed to treat with the Corporation on the basis of their offer; but the thing has been stopped in limine by the Directors and Officials of the Company.

Cross-examined by Sir E. BECKETT: The result of the voting by proxies at the Wharnclyffe meeting was that there was a large majority in favour of going on with the Bill. The question as to purchase by the Corporation was not put to the meeting. The Corporation have not done anything since last year towards enforcing the supply of water in the Sherborne Street district. There have been no complaints recently from that district, and therefore there has been no special reason for bringing compulsory powers to bear. The great objection is to the cost of cisterns, &c. It is an exceedingly difficult thing to work the compulsory powers of the Public Health Act. I do not think the Corporation could call upon owners of small cottages to erect cisterns, ball-cocks, &c., which would cost £5 at least. I told the Company that it was no use putting down mains unless there was to be a constant supply. They said they could not give it. I

have not entered into the question whether there are any towns in which the objects of the Public Health Act have been attained, although the Corporation have not the control of the water supply.

Sir E. BECKETT: What do you imagine you can do, supposing you get your Bill, that you cannot do with ours?

Witness: I think, upon the report of the Surveyor, we should, without any hesitation, carry our mains to any district, if the works were in our hands, and we cannot do that now—or, at all events, we do not do it.

Cross-examination continued: I do not think the Company thought of coming to Parliament until they knew that the Corporation were going to take action, and Mr. Hawksley told them it would be useless for them to oppose the Corporation Bill unless they had one of their own.

Dr. Alfred Hill said: I am Medical Officer of Health and Borough Analyst to the Corporation of Birmingham. I constantly trace a connection between the prevalence of typhoid fever, diarrhoea, and other diseases of that class, and the use of sewage water. In 1849 and 1854, when certain parts of London were supplied with Thames water, cholera was evidently produced by the use of it. In the former year, when the Southwark and Lambeth Companies drew their water from below Battersea Bridge, within the tidal influence, and therefore within the influence of pollution from sewers, the districts supplied by them suffered very much from cholera, and suffered equally. Subsequently, in 1854, when the Lambeth Company had removed their intake to above Teddington, it was found that there was a very high mortality from cholera in the district supplied by the Southwark Company, and a very low mortality in the district supplied by the Lambeth Company. In 1866, when one of the reservoirs of the East London Company was accidentally contaminated by polluted water from the Lea, it was satisfactorily made out that the cholera which existed that year was coincident with the supply of water from that source. Another illustration of the effect of sewage in water was afforded by the town of Doncaster. According to Dr. Simon's report, the epidemic of cholera in Sheffield began a few weeks before that in Doncaster, which is lower down the river, and terminated a fortnight before. That shows that infected sewage was not purified by passing 15 or 20 miles down a river. The facts are against Mr. Hawksley's statement that sewage is annihilated by a flow of 15 or 16 miles. Those who hold that view mistake clarification for purification. What may be called natural sewage I think may frequently be drunk with impunity. It is specially infected sewage that is dangerous. A chemist cannot by analysis point out the specifically infected substances. He can only give the chemical character of the water, from which he may draw an inference as to its being polluted or not, but he cannot say that it is positively injurious to health. That can only be proved by a physiological test—namely, by the disease being produced in those who drink it—and that is an experiment which all wish to avoid. It has been tried over and over again, with very fatal results. I think it is indispensable that all local authorities should have the control of the water supply. I assisted the Town Council of Birmingham two years ago in getting the control of the water-works and we have reason to be highly satisfied with the result. We find that we can carry out reforms which it was impossible for us to carry out when the supply was in the hands of the Company. The health of our town has been improving for some years, in proportion as attention has been paid to general sanitary regulations, including the water supply. Birmingham used to draw a large supply from the river, but the inhabitants are gradually relying more and more upon those streams which are fairly pure, and upon the water from the deep red sandstone. I do not know of any previous case of a Company who had obtained their parliamentary powers on the faith of giving a spring water supply, afterwards coming to Parliament to substitute a river water supply. I know a great many cases of the opposite process. The common-sense feeling is that those rivers which are sewers for the country should not be used as sources of water supply. I do not think it is in any sense justifiable that this Company should endeavour to use their position to force upon a community an inferior supply to that which they were first authorized to give. The sanitary obligations of a public authority cannot be properly carried out unless they have the control of the water supply.

Cross-examined by Mr. VENABLES: I believe when the Committee of the House of Lords passed the Birmingham Water Bill, the Chairman expressly stated they passed it on the ground that under a former Act, which was passed with the consent of the Company, the Corporation had power to purchase. I know that Dr. Letheby said there was no proof of choleraic pollution of the water at the East-end of London, but I read both sides of the story, and I do not agree in his view. Probably the intake of the Southwark Company was close to the discharge of a large sewer. According to modern physiological views, faecal matter does not get oxidized by passing down a river. As the water supply of Birmingham has increased, disease has diminished. The diseases which are likely to be communicated by impure water are cholera, diarrhoea, and typhoid; it would not extend to scarlet fever.

Dr. Frankland, F.R.S., President of the Institute of Chemistry, Professor at the School of Mines, and one of the Rivers Pollution Commissioners, said that he had in 1865 visited the Severn with Dr. Odling, with the view of assisting the inquiry in that year. He was well acquainted with the basin of the Severn from its source to the tidal estuary. In the winter season the Severn was liable to heavy floods. It must be regarded as a peculiar river. It differed widely from the Thames, since there were in the latter no highly absorbent strata. The flow of the Thames was much more equable than that of the Severn. In times of flood, scourings from the surface of the land were brought down by the Severn. There was, however, a remarkable difference between the Severn and the Thames. In the Thames basin the flood water was always the worst, whereas in the Severn basin it appeared to be generally the best. When the River Severn was low, it was a very bad quality, whereas it was a fact that the water of the Thames above Teddington Lock was at its best. He did not think that the Severn water was a proper water to be supplied to any town, and it would be little short of madness to supply it to a town like Cheltenham, the prosperity of which depended mainly on its sanitary condition.

Mr. POPE: You think that the reputation of a place like Cheltenham should be beyond reproach?

Witness: I do.

Mr. POPE: Do you believe that in a run of 14 miles the sewage of a town like Worcester would be destroyed by oxidation?

Witness said he did not. He had made experiments on the Thames, Irwell, and other rivers, and he had come to the conclusion that oxidation was a question of degree. In a flow of 15 or 20 miles, he was of opinion that oxidation was very slight indeed. There was no river in the United Kingdom long enough to oxidize sewage, even although it was put in at the source of the river. On the Severn there were manufactories and mines, and at times he had ascertained that there was an appreciable amount of contamination arising from such circumstances. He had found arsenic in the Severn above the town of Newtown, in Montgomeryshire. In the summer time the flow of the Severn at Tewkesbury was as low as 90 million gallons. The minimum flow of the Thames at Teddington, within the last 15 years had been 350 million gallons daily, but that was after the abstraction of the water for London. There were impurities that



found their way into rivers which defied chemical analysis. A chemist might find impurities, but he could not distinguish between the healthy organic matter of sewage and the organic matter containing bacteria and the various germs of disease. Cholera poison might be in water, and yet it might not be detected by analysis. During the last visitation of cholera in London, in 1866, he obtained the evacuations of a patient who had died of cholera, and from the experiments he had made, after mixing it with water, he was unable to detect the impurity.

Mr. POPE: Have you any belief in the existence of germs of disease, such as we have heard described?

Witness: There can be no doubt about it. It is a matter of common knowledge among scientific men.

Examination continued: If Cheltenham was supplied with water from the Severn, it was obvious that the Sanitary Authority would have no control over the pumping of water or the supply. He did not think it was possible, by any practical means, so to purify the sewage as to guarantee its freedom from disease germs. The water from the Cotswolds was excellent. It was the same class of water that supplied the Thames basin, and was derived from the oolitic formation. He produced several samples of Cotswold water, and explained its properties, and expressed his opinion that it was admirably adapted for the supply of a town like Cheltenham, if it could be obtained in sufficient quantity.

Cross-examined by Sir E. BECKETT: The reason was because it was derived from sources which had no sewage contamination, and because it was palatable, bright, and sparkling. No doubt the water that fell as rain would be, to a certain extent, surface drainage. As investigation went on, it seemed to draw the line of suspicion tighter and tighter around water as the source of disease. Many thousands of people had had cholera or typhoid fever through drinking water. The evidence afforded by the two epidemics of 1849 and 1854 was most conclusive on that point. Nothing could be more conclusive, unless the poison was administered to people, and the effects were noted. He did not think distance made any difference in the injurious effect of sewage. While London was drinking its own sewage, there was a great deal of cholera. In the year 1866, when all London was drinking either Thames water or Lea water, there was an outbreak of cholera; but whether it was in consequence of drinking that water he could not say. Since the Thames water had been taken from above Teddington Lock, people who drank it had died of cholera. The cholera in the East-end of London was said to have arisen from the leakage of some Lea water, which had received sewage, into a reservoir. The drain in that case was not far from the reservoir.

By Mr. NOEL: I made an analysis of a sample from the pure-water tank at Tewkesbury. In the analysis furnished by the Company, the organic carbon was .155, and the organic nitrogen .036. My own analysis showed that, in the sample supplied to me, there was .244 of organic carbon and .032 of organic nitrogen, so that the proportion of sewage matter was slightly less than in the Company's analysis.

THURSDAY, MARCH 14.

Mr. J. E. Way, examined by Mr. BALFOUR-BROWNE.

I am a consulting and analytical chemist, and was for many years consulting chemist to the Royal Agricultural Society of England. I was a member of the first Rivers Pollution Commission. In 1864 I examined samples of Severn water, and gave evidence before the Commons Committee on the Bill of 1865. I considered that the Severn water was not a proper water for the supply of Cheltenham. I was in favour of a supply from the springs in the neighbourhood, that water being of excellent quality. I considered the Severn water was unfit, from the fact that the river receives the drainage and sewage of a large district. It was a sluggish, muddy river. Its temperature varied greatly with the seasons of the year; but the spring water has an equable low temperature. As Cheltenham is the resort of invalids, it is peculiarly dependent upon its water supply. I visited the springs in the neighbourhood on the 23rd of February. I saw the Dowdeswell Wood Spring. I should hardly like to say the probable quantity of water, but the whole hillside seemed to be full of water; in fact, it was most unpleasant to walk on. The ground seemed very favourable to the construction of reservoirs. I have examined samples of water from the Dowdeswell, the Lynover, and the Rosley Wood Springs. They are very good, pure, and bright, and of good colour and taste. The water on evaporation gives an absolutely white residue, whereas the water of the Tewkesbury supply, and still more that of the Severn, unfiltered, gives a brownish yellow residue. There is nothing more distinctive of the purity of water than that very simple experiment. All river waters give more or less tinge to the residue.

Mr. BROWNE: Does the analysis show the spring waters are free from an excess of saline and organic matters?

Witness: Yes; they contain a very moderate proportion of organic ammonia. They are considerably softer than Thames water, and become very soft after boiling.

Is it your opinion as a chemist, from your examination of these waters, that they may be safely recommended as a good town supply?—I have not a doubt about it. The impurity of the Severn water, as indicated by the organic ammonia, is considerably in excess of the spring water. In the case of the Tewkesbury supply, it is fully twice as much as in any of the springs.

Do you adhere generally to the opinion you gave in 1865, that Cheltenham should be supplied from springs, and not from the river Severn?—I think, unless there is an absolute necessity for going to the Severn, that the water supply should not be taken from it.

Is it conformable with your experience that a considerable amount of sewage might be present in such a river as the Severn without being detected by chemical analysis?—If you take absolutely pure water, you will necessarily find no organic nitrogen, and on no account ammonia; but according to the relation in which the water becomes impure by drainage and sewage, so the organic nitrogen becomes considerable. The whole question is a question of degree. No chemist would attempt to say exactly when a water was an injurious water; but if there is an increasing amount of impurity, the water might very properly be considered to be liable to danger, if not actually injurious. Whether considered in the form in which I make my analysis, which is of organic ammonia, or taking it in the form in which Dr. Frankland, Dr. Tidy, and other chemists make it, which is of absolute organic nitrogen, the properties indicating sewage or matter of that kind are, in the hundred thousand parts of a gallon, extremely small. In such an analysis, as Dr. Frankland put in, the quantity that is represented by even the third decimal figure in the analysis actually represents thousands and tens of thousands, I was going to say hundreds of thousands of gallons of sewage, present in the water. Supposing the river has now a supply of absolutely pure water—I do not say that it has—but supposing it has, the figures that have been given by the chemists, for the quantity of organic nitrogen, would represent from 400,000 to 500,000 gallons of sewage by the time it got to Tewkesbury. I have no doubt, as all chemists are aware, that an apparently very small quantity of organic nitrogen may indicate a large quantity of sewage.

The figures in the analysis convince you that Severn water is not good for household or drinking purposes?—The figures are consistent with impure water.

Cross-examined by Mr. MICHAEL: I do not think my recent investigations induce me to alter my opinion as to the meaning of the analysis of water or the modes of conducting it. There are two methods of analysis, one by Dr. Frankland, which is adopted by a good many chemists, and the other by Professor Wanklyn. They are both good; the difference being probably that Dr. Frankland's, so far as nitrogen is concerned, gives the absolute quantity of nitrogen, and Dr. Wanklyn's gives the relative quantity of nitrogen; that is to say, two waters will give different quantities of nitrogen in the form of ammonia, which do not indicate any absolute quantity, but undoubtedly indicate a relative quantity.

Mr. MICHAEL: Are chemists agreed, when you have got your absolute quantity of nitrogen, what it means?

Witness: They may in course of time be able to say whether so much absolute nitrogen is injurious, but they can only say so now in a broad way.

Are you able to say what the absolute amount of carbon is?—If there was nothing but nitrogenous matter passing into the river, the carbon and the nitrogen would correspond; but there are vegetable matters and peaty matters, and so on, that cause a difference in the carbon.

Has anything else occurred which has changed the views you held for some time with respect to water and sewage contamination? What is your general idea of an analysis?—Analysis undoubtedly tells you what is the state of the water with regard to organic matter; but when you have got that analysis you have still to say where the point of danger commences.

Can you say that?—Not absolutely, but relatively. We can say, "Here is a water free from organic matter, and here is one that shows a great deal." We say the latter is more likely to prove injurious, not that it is absolutely injurious, but that it is more possible it would be injurious than the water that contains little organic matter. I do not know what is the quantity of organic nitrogen that should exist in order that the water might be ranked as a dangerous water for ordinary domestic purposes. That is a point on which Dr. Frankland has given his opinion; but I should not like to say.

Do you think that any sewage could be in water without detecting it?—We detect it by inference, by the quantity of the organic nitrogen or organic ammonia. Sewage in running water is no doubt oxidized to a considerable extent. I should say oxidation commences immediately it is put in.

What is the important element of oxidation in a river? Is it time or distance?—They are much the same thing. The more the water is aerated the more rapidly would the sewage be got rid of.

Do you take it that it is owing to the presence of air alone without reference to vegetation?—Yes.

How long do you think sewage would be in the water before the process commenced?—It is impossible to say. I believe the moment the sewage enters the water oxidation begins.

How many miles would there be in an ordinary river before oxidation begins?—That is impossible to say. I do not think I have ever said how many. I cannot give you any idea. I have not had an opportunity of making any analysis of the river to determine what the quantity of organic nitrogen is at various points. That would be a test of the comparative purification. My point is this, that the differences are so small, to indicate the getting rid of a very fair quantity of sewage, that the errors of analysis would be more than those differences.

If there are two modes of analysis, and both are correct, there must be a relation between the two?—They are not absolutely comparable; they are comparable in their results, but not in figures. From analysis I find that there is twice as much organic ammonia given by the Tewkesbury supply as there is by the least pure at the spring, and eight times as much as by the most pure at the spring.

I suppose I may take it that water, especially coming over a manured surface, can hardly have so small a proportion of organic nitrogen as this water you have taken out of the springs?—The water coming from Dowdeswell Wood would principally take up the matter of dead leaves. It is an extensive wood, covering all the hillside. There is no chance of manuring the wood, and if there is any impurity in the water, it will be of the vegetable character. I do not say that the colour of the ash, after the water is analyzed, would give any information as between vegetable and animal matter. The Severn water I examined, after filtration, was not coloured with peat.

If I had sent you, without any information whatever, a sample of this water, and told you nothing of the source from whence it was derived, and you had made an analysis according to Professor Wanklyn's method, would you have said it was a dangerous water?—No; I should not have said that; and in one case out of a hundred, it is not a dangerous water. If it be overloaded with organic ammonia, you might fairly say it is a dangerous water; but nobody pretends to say that that quantity of organic ammonia makes the water dangerous. There is a difference between water being dangerous, and being liable to be dangerous. So far as my analysis is concerned, the water is very similar to the water of the Thames, and I do not consider Thames water as dangerous, although it is not so pure as it ought to be.

Mr. BROWNE (in re-examination): When you have a choice of water which is very pure, and a water which is not so pure as it ought to be, if you had been asked to recommend one of these, you would have recommended the spring water?

Witness: Undoubtedly, I should have done so.

Dr. Stodhart said he was a Fellow of the Chemical Society, Fellow of the Geological Society, and Analyst to the City of Bristol and to the County of Somerset. He had made an analysis of the water obtained from the springs at the head of the Dowdeswell Valley. The springs flowed from the upper surface of the lias clays. They did not flow through the lias, but simply over it, the lias being impermeable. They made their exit at an altitude of about 700 feet above the level of the sea. He found the spring water to be free from any trace of sewage or contamination. Before he got the water at the springs, it must have passed through a thickness of 160 feet of oolitic beds, and he should have expected more solids than he actually found. There was very little solid and very little hardness. There was a minute quantity of organic matter in solution; but he thought that resulted from vegetable origin. He thought the water would be suitable for such a place as Cheltenham, and agreed with the other witnesses that it contained a very small quantity of nitrates. He also made an analysis of the water taken from the stream at the side of the reservoir, and found it of very good character, and fit for a town supply. He thought the place chosen for the reservoir was uncommonly well suited for the purpose. He had made hundreds of analyses of the water of the Severn in the course of his life, but the analyses he made within the last few months showed considerable differences in the quality of the water from time to time. The principal difference between the Severn water and that of the springs would be in the quantity of ammonia, but if the dilution of the water was taken into consideration, the organic ammonia must be very large indeed. He was totally surprised when he heard that anybody in Cheltenham ever dreamed of having a supply from the Severn.

Mr. Taunton, C.E., said he was formerly Assistant Engineer to the



Grand Junction Water-Works Company, and had constructed water-works at various places. He had also been Engineer to the Thames and Severn Canal Navigation Company for nearly 26 years. So early as 1854 his attention was directed to the Cheltenham Water-Works Company. He was concerned with the late Mr. Simpson in opposing, on behalf of the Proprietors of the Colne Valley, the application to take the Sierford Springs. That Bill was thrown out because the fact was established that there were waters on the west side of the Cotswolds that were available for the supply of Cheltenham. In 1854 he caused gaugings to be taken of the springs and streams in the neighbourhood of Cheltenham. In the dry weather season, in March of that year, the Dowdeswell Wood Spring yielded 1,266,728 gallons per day, and the Leckhampton Spring yielded 433,368 gallons. Gaugings were also made of the two branches of the Prestbury Brook. The main branch gave 343,872 gallons per day, and the smaller branch 49,428 gallons. Neither the Leckhampton nor the Prestbury Spring flowed into the Chelt. In 1864 he was employed by the Commissioners of Cheltenham to report upon any matters connected with a water supply. He recommended, amongst other sources, a supply from the Chelt as being the best. The scheme was identical with the present one, except as to the site of the reservoirs. The Chelt was the principal stream in the district, and sufficient water being obtainable for the present wants of Cheltenham, he had selected it as the best source. He took the minimum gauging of the stream in March, 1864, and had taken the average flow of water at 1,375,000 gallons per day, but he had since worked out an average of 1,465,000 gallons per day. He thought the results taken in 1864 were to be relied upon, because the gaugings were taken over a considerable period. The rainfall in 1864 was one of the lowest that had ever been known in the Cotswold district. On April 29, 1864, he took a gauge of the Chelt at Dowdeswell mill. There had not been rain for 20 days, and it was then yielding 576,000 gallons per diem. These gaugings were made by direction of the Cheltenham Commissioners, for the purpose of a parliamentary inquiry that was pending about that time. He also gauged the stream on the 19th of July, when there was a general drought, and there was at the Dowdeswell mill a yield of 197,000 gallons per day. That was, however, an exceptional period of drought. In 1865, when the Cheltenham Water-Works Company proposed to take powers, he made other gaugings, but it was not a favourable season. The minimum gauge between the 22nd of February and the 13th of March was 1,256,360 gallons per day. That was got at Dowdeswell, just below the osiery. Prestbury Brook gave 439,722 gallons. He had prepared an abstract of the gaugings taken at the three different periods. Starting at the time when there was a moderate fall, the Chelt at Dowdeswell yielded nearly 1,250,000 gallons per day; and after a drought of somewhat over a month he found it yielded between 500,000 and 600,000 gallons per day, and the lowest yield he had ever found, at the driest time he had ever known, was about 200,000 gallons per day. In periods of flood these springs gave out about 7,700,000 gallons per day. The purpose of the reservoir in his scheme, and that now before the Committee, was to store flood water when the rainfall was reduced to its lowest. He had no doubt that the hills around Cheltenham would afford an ample supply for the town; in fact, they could supply more than was necessary. With the storage proposed, 400,000 gallons per day might be taken as a fair average yield of the streams feeding the Chelt during a time of flood; 600,000 would be provided by storage, making a total of 1,000,000 gallons per day uniform supply. The cost of the scheme of 1864 he estimated at £30,000. The reservoirs proposed by Mr. Bateman were larger than those of his scheme of 1864, and, therefore, the present estimated cost would be higher. He thought that Mr. Bateman's estimates were safe. He then gave some detailed information as to the rainfall of the district, and said that, in his opinion, the proposed watershed was well suited for the collection and distribution, by gravitation, of water to Cheltenham; in fact, it could not be better. He considered it quite sufficient for all present or prospective requirements. It was an unquestionably better plan than going eleven or twelve miles up the Severn, and pumping water to a height of 370 feet. The permanent expense of pumping and filtration was one of the great objections to the Company's scheme; but the greatest objection was supplying river water to such a town as Cheltenham.

Cross-examined by Sir E. BECKETT: The gaugings he made in 1864 extended over a period of 20 days, in March and April. There were no gaugings taken between the end of April and the middle of July. He took the gaugings for the purposes of a parliamentary inquiry. In April the South Cerney Bill fell through, and he took the other gaugings on his own account, as a matter of curiosity, with a view of arriving at the lowest possible flow of the Chelt. The average of the 20 days in spring was 2,250,000, and the minimum flow 200,000 gallons. The drainage area through which the streams passed, available for the supply of Cheltenham, was 6400 acres. He was not proposing to deal with these 6400 acres, or the streams of it, in any way whatever.

Sir E. BECKETT: What is the real area, you deal with?

Witness: I am dealing with no area; I am stating that there are 6400 acres of gathering-ground around Cheltenham, which may be made available for the supply of the town.

Mr. Humphris, Borough Surveyor, gave evidence as to the number of streets that had none of the Company's mains in them. There were nearly eight miles in all. The greatest portion that was unsupplied was in the North Ward. The streets were generally composed of houses of the poorer class of property. In his capacity of Surveyor, he had had to do with the putting up of urinals, and wells had to be sunk because there were no means of getting water from the Company without cisterns, which it was inconvenient to place there, and also because no terms had been come to for a supply. The Corporation proposed to purchase the mills on the stream, and to do away with the dams, which had the effect in a time of flood of seriously interfering with the drainage, and of flooding some of the houses. He had prepared a table of gaugings taken from September to the end of February—they were taken at the side of the proposed reservoir. Comparative gaugings of the streams of Dowdeswell and Sandford showed that about half the total of the streams above Sandford mill could be taken into the reservoir. In addition to the springs proposed to be taken, there were others which could be included at some future time.

Mr. John Frederick Bateman, examined by Mr. BROWNE, said: I have had experience in hydraulic engineering for more than 40 years. In 1854 I was requested by the Improvement Commissioners of Cheltenham to consider the best means of getting water for the supply of the town. They did not complain of the quality of the water given by the old Company, but they considered the quantity quite insufficient. I examined the springs and streams flowing from the Cotswolds. I had examined the whole of the district when considering the water supply for Gloucester, and finally determined that the best place from which to obtain a supply of water was, geologically speaking, identical with the district now proposed for Cheltenham. I recommended the construction of a reservoir on the Chelt, near Dowdeswell, because I believed that a sufficient quantity of water could be obtained from there for the supply of Cheltenham, and at the cheapest rate. I examined the district again in 1864, and came to the same conclusion. Last year my previous opinions were confirmed by further examination, and I recommended the Corporation to prepare the plans which are now before the Committee. The gaugings which were taken,

except the few by myself and assistants, were those taken by Mr. Taunton and Mr. Humphris, from time to time, and I was satisfied from these gaugings that not only was there a large supply of spring water from the Cotswolds, in the neighbourhood of Cheltenham, but I felt justified in assuming that the quantity of spring water in the valley of Dowdeswell, where the reservoir was proposed to be placed, would, in a long drought, equal 400,000 gallons per day, and the reservoirs which would collect the flood waters ought to be made large enough to supplement the amount of water during a dry period. The question, therefore, to be decided was the size of the reservoirs; and, assuming 400,000 gallons as the produce of springs, I directed that reservoirs should be laid out, which should contain 150 days supply of 600,000 gallons a day, so as to make up the total quantity of 1,000,000 gallons a day. The gaugings taken in 1864 are more reliable than those of last year. The geological character of the district is very favourable for the production of spring water. Cheltenham contains about 52,000 population, including the suburbs, and it is not very rapidly increasing. It is a residential place and a place of enjoyment, and has no manufactures, so that 20 gallons per head per day would be sufficient. The estimate for the works is £51,500, including the purchase of the mills, and this I think adequate for all purposes. In my opinion the water at Dowdeswell is far superior to that of the Severn at Tewkesbury. I think Corporations holding water-works are calculated to carry out more satisfactorily than Water Companies the sanitary improvements of a town, because Companies look only to their dividends.

Sir E. BECKETT (in cross-examination): Will you explain why, after recommending 250 days supply for Gloucester, you only take 150 here?

Witness: 180 days may be required; but, if you lengthen the duration of the drought, you probably increase the volume of the springs, because, during a very long drought there is a certain amount of rain falling, and, in a geological formation like this, the water permeates the colite, and the springs are probably increased.

(To be continued.)

## Legal Intelligence.

### HIGH COURT OF JUSTICE—COMMON PLEAS DIVISION.

FRIDAY, MAY 3.

(Before Lord COLERIDGE and Justice DENMAN.)

WALKER v. THE GASLIGHT AND COKE COMPANY.

The plaintiff in this case claimed damages for very serious injuries suffered through the giving way of a derrick at the defendants' works at Bromley, where the plaintiff was employed as a labourer in the service of some contractors who were erecting a coal lift there. At the trial before Justice Manisty, at Chelmsford, the Jury found for the plaintiff, with £1050 damages, and his lordship had declined to give any facility for questioning the verdict.

Mr. WILLIS, Q.C., now moved for a rule for a new trial, contending that there was really no evidence of negligence on the part of the defendants, and that the damages were excessive. He added that he had affidavits that the plaintiff had since the verdict been seen walking about apparently free from distressing symptoms he had exhibited previously.

Lord COLERIDGE said there would be a rule upon the affidavits, so it might as well go upon the other points.

### LEEDS POLICE COURT.—FRIDAY, APRIL 26.

(Before Mr. BRUCE.)

CONVICTION FOR WASTING WATER.

Mary Ann Whitlam, of 13, Cross Belgrave Street, was summoned, under the 40th section of the Leeds Water-Works Act, 1867, which enacts "That if any person supplied with water by the Corporation shall wrongfully cause or suffer any pipe, valve, cock, cistern, bath, soil-pan, water-closet, or other apparatus or receptacle to be out of repair, he shall for every such offence forfeit to the Corporation any sum not exceeding £5." A second summons was also taken out against the defendant, under the 26th section of the Leeds Corporation Water Act, 1874, which enacts "That any officer of the Corporation, duly appointed for the purpose by them, may, between the hours of nine in the forenoon and four in the afternoon, enter any building or place supplied with water by the Corporation, in order to inspect the meters, pipes, fittings, and apparatus for regulating the supply of water, either for the purpose of ascertaining the quantity consumed or supplied, or to see whether the meters, pipes, fittings, cisterns, or other apparatus provided be in good repair; and that if such agent or other officer at any such time be refused admittance into such premises for the purposes aforesaid, or be prevented from making such examination, the occupier shall for every such offence forfeit to the Corporation a sum not exceeding £5."

The defendant did not appear.

The Town Clerk (Mr. G. W. Morrison), who appeared in support of the information, said that on Monday the 4th of March, Geo. Wilkinson, an Inspector of Fittings to the Corporation, visited the house of the defendant to examine the water-fittings, and having reason to believe that the ball-cock in defendant's cistern was out of repair, requested to be allowed to go upstairs to examine it, but defendant would not allow him to do so, and forthwith shut the house door in his face. Wilkinson reported this to Mr. Wood, the Chief Inspector of Water-Fittings to the Corporation, who wrote the following letter to defendant:—

Leeds Water-Works Department, Victoria Road, March 5, 1878.

To Mrs. Mary Ann Whitlam, 13, Cross Belgrave Street, Leeds.

Madam,—The Inspector of Water-Fittings called at your house yesterday, when you refused to allow him to make the necessary examination of the water-fittings. As this is not the first time you have done this, it is my duty to inform you that the Act of Parliament provides that the officers of the Water-Works Committee may, between the hours of 9 a.m. and 4 p.m., enter into the houses of persons supplied with water by the Corporation, for the purpose of examining the water-fittings to see that they are kept in good repair, and any persons refusing the officer admittance, render themselves liable to a penalty of £5. We have no desire to cause unnecessary annoyance, and hope, when the Inspector calls again, it will be convenient for you to allow him to make the necessary inspection.

(Signed)

GEORGE WOOD, Chief Inspector of Fittings.

On the 11th of March the Inspector called again, and was permitted to enter the house. When he got upstairs, he found the ball-cock in the water-closet cistern was out of repair, and allowing the water to run to waste down the overflow-pipe almost at full bore. He told defendant of this, and said she must get it repaired. She said she should not do it; whatever was required to be done would have to be done by the owner of the property. A notice was sent to the owner of the property to make the necessary repairs. The owner immediately gave orders to Messrs. Walsh and Son, plumbers, to make the repairs. They sent a workman on Friday, the 22nd of March, to do what was necessary, but defendant would not allow him to go into the house, and said there was nothing the matter with the fittings. The waste of water had been going on from the 4th of March. The Inspector, on visiting the house the previous day, found the waste still taking place, at the rate of 360 gallons per day.

The Town Clerk called several witnesses to prove the above facts.

Mr. BRUCE commented strongly upon the conduct of the defendant, and inflicted a penalty of 50s. in each case, including costs.



Miscellaneous News.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health, on the Composition and Quality of the Metropolitan Waters in April, 1878 :—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by		Nitro- gen.		Ammonia.		Hardness (Clark's Scale).	
		Organic Matter, &c.	As Ni- trates, &c.	Sa- line.	Or- ganic	Before Boil- ing.	After Boil- ing.		
<i>Thames Water Companies.</i>									
Grand Junction . . . . .	18·00	0·089	0·105	0·000	0·009	12·1	3·3		
West Middlesex . . . . .	17·10	0·053	0·129	0·000	0·009	12·6	2·8		
Southwark and Vauxhall . . . . .	18·10	0·046	0·105	0·000	0·008	12·6	2·8		
Chelsea . . . . .	18·20	0·046	0·150	0·000	0·008	12·6	2·8		
Lambeth . . . . .	19·40	0·042	0·161	0·000	0·008	13·2	3·3		
<i>Other Companies.</i>									
Kent . . . . .	23·70	0·014	0·435	0·000	0·003	19·4	6·0		
New River . . . . .	17·40	0·042	0·165	0·000	0·006	12·6	2·4		
East London . . . . .	18·70	0·042	0·165	0·000	0·008	12·6	3·3		

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases.  
C. MEYMOTT TIDY, M.B.

MAURITIUS GAS COMPANY, LIMITED.

The Ordinary General Meeting of Shareholders was held at the London Offices of the Company, 29, Great St. Helen's, on Tuesday, the 30th ult.—W. WHITE, Esq., in the chair.

The SECRETARY (Mr. A. Hersee) read the following report :—

In submitting the accounts for the past year, the Directors are pleased to report that the operations of the Company, during the above period, have resulted in a further improvement.

In public lighting, there has been an addition of five street-lamps, but the consumption of gas generally for municipal purposes shows a diminution, in consequence of economy introduced by the late Mayor, and the limited duration of the opera season.

A satisfactory increase in the private consumption of gas has taken place, which, if it should prove continuous, will tend to a steady improvement in the Company's position. The condition of the island, owing to better sugar crops, is becoming more prosperous, and encourages the anticipation of a revived demand for gas in Port Louis.

The cost of coal continues moderate, and there is every reason to believe that, in the absence of political complications, a full supply of coal for the present year will be obtained on favourable terms.

The rates of exchange are still very onerous, and there does not appear any prospect of immediate improvement; it is believed, however, that the price of silver will rise shortly, and cause an upward movement in exchange.

The Members of the Resident Committee, Messrs. H. Adam, M. Connal, and J. A. Ferguson, in conjunction with the Manager, Mr. Delachi, have again given their attention to promote the progress of the Company, and to maintain the works in efficiency.

The general revenue account shows a balance of £1929 2s., out of which the Directors recommend a distribution of 1s. 6d. per share, or £3 6s. 8d. per cent., free of income-tax, payable on the 10th of May.

The Director who retires by rotation is William White, Esq., and the retiring Auditors are John Robinson Peill and Thomas Newton Stokes, Esqs., all of whom are eligible for re-election, and they offer themselves accordingly.

The CHAIRMAN, in moving the adoption of the report, said: Gentlemen, I have very few remarks to offer you on the present occasion, because nothing of a striking character has occurred since our last meeting. It is satisfactory, however, to be able to present rather a better account, and to show that as yet there is certainly some life in the concern. The increase in the dividend is not very large, but it is a move in the right direction; and although our first expectations are not realized, there is every reason to hope that further progress will result in the coming years. It happened unfortunately to the Company that the Mayor of Port Louis, in his endeavour to secure some popularity, turned his attention to the unsparing reduction of expenditure; and the diminished consumption of gas in the municipal buildings, prisons, fire-engine stations, &c., has affected our revenue to the amount of nearly £200. It is believed that this cutting-down process has now run its course, and we are not likely to suffer any further in this direction. A few more street-lamps have been erected, but the number ought to be increased, if the Municipality were flourishing, and they were not in want of funds. The increase in the private lighting exceeds 7 per cent. That is very encouraging as a sign of vitality; and, as has been before pointed out, the Company are in this position, that they are quite prepared to meet a largely increased demand for gas with the present appliances, if an extended consumption is required. Trade in the Mauritius for some years has not been profitable; but a favourable turn now appears to have set in, and there is a promise that last year's excellent crop of sugar will be followed by an equally good one this year, which will put people in spirits, and be a stimulus to business in Port Louis. The place is isolated for want of telegraphic communication; but an agitation has arisen in favour of the laying of a cable between the Cape and the Mauritius; and, if carried out, I think it will be a great gain to the island, and increase its importance. The circumstances affecting coal are still favourable, and seem likely to remain so, unless the incidence of a war should occasion any rise in freight, or a scarcity of ships. The Australian coal is less liable to spontaneous combustion than the English coal, and, therefore, suits us better; but the advantage of price at the present moment is much in favour of the English coal, and, therefore, we get our supply from this country. The loss on exchange, though not so oppressive as in the previous year, is still serious; and, unless the rate improves, must become more so on the remittances as the profits increase. There is a current impression that the resumption of specie payment by America and other countries will enhance the value of silver, and so occasion a rise in exchange, which we hope will come to pass; but it is not yet apparent in any way. As regards the general working of the concern, every effort is being made to increase the revenue, and to keep down expenditure. The result of the past year's operations, although disappointing, and affording an inadequate return on the capital, shows a marked improvement over the preceding year, which there is every encouragement to believe will be continued. In making these few observations, I beg to move—"That the report and accounts, as now read, be received and adopted;" but before putting the motion to the meeting, I shall be happy to answer any question, as far as I am able to do so, that any of the Shareholders may think proper to ask.

Mr. STOFFORD seconded the motion.

Mr. STEPHENSON said he would like to make a suggestion. There was little doubt that the extremely moderate position which the Company occupied had been brought about in great measure by the unprecedentedly low price of freight, and the moderate price of coal that had existed for some time past; and, therefore, in the event of an extreme rise in freight or in coal, it seemed to him that the Company would suffer very materially; because the concern of which the Directors had the management was a

small one. The suggestion he wished to throw out for the Board was this: Whether the proper time had not arrived when the works could be disposed of to some other Company who had other stations, and who could manage the concern much more economically, probably, than it could be worked by separate management. If the Directors found that that suggestion could not be satisfactorily carried out, perhaps the better course would be to considerably enlarge the business of the Company by tacking on other places. This would also be better for the Shareholders. Certainly only £2 5s. per share had been called up out of £5, and there was an additional £2 15s. that could be called up, with the sanction of the Shareholders, if it was resolved to take up other businesses. It seemed to him that, instead of the Company keeping themselves in the small unsatisfactory position they at present occupied, if they could search out for other places that might be profitably tacked on to them, and if, for this purpose, the remaining £2 15s. were called up, the position of the Company would be more satisfactory to the Shareholders. He did not wish for an answer; he merely threw out the suggestion, in order that it might be taken into consideration by the Board.

The CHAIRMAN, in answer to Mr. Stephenson, said that when the Company were originally instituted, they issued rather more capital than they otherwise would have done, with the expectation of being able to do as Mr. Stephenson had suggested; but the Company paying such a small dividend as they did at present, of course, other concerns were not very anxious to tack them on. Negotiations had been going on with two or three other stations at different places; but the Directors found that, by joining the business of the Company to that of those he had referred to, the position of the Company would be worse than it was at the present moment.

The motion for the adoption of the report was then put and carried unanimously.

Mr. WARD wished to know what was the consumption of coal. He observed that the stock was valued at £2500, and he asked how long it was likely to last.

The SECRETARY said it would last about seven or eight months.

The CHAIRMAN said that when the coals fell to such a low figure the Directors thought it advisable to lay in a good stock; but it was not so much the price of coal that had to be considered, as it was the question of the rise in freights. It should also be borne in mind that there were only certain seasons of shipping. When the ships called at the Mauritius for sugar, was the only time that coals could be obtained, except at exorbitant rates.

Mr. GOODWIN asked what the state of the gasholders was.

The CHAIRMAN said that there was much more room now than formerly. There were now two gasholders, so that double the business could be done, if necessary; and since the old one had been properly repaired, they both worked uncommonly well, and there had not been a single complaint in regard to them since.

Mr. STOFFORD moved the re-election of Mr. White (the Chairman) as a Director of the Company. Mr. White had been Chairman ever since the Company were established, and he had no doubt that the concern under him would be as prosperous as all the others with which he was connected.

Mr. WARD seconded the motion, which was carried by acclamation.

The CHAIRMAN, in responding, said that this was almost the only difficult thing he had had to do with for some years—at least more difficulties had surrounded the Company than he had anticipated when he joined the Board; but he could not help thinking they would get over all their difficulties, and make the concern something like a fair paying one. Of course if, in the event of war, there was a rise in freights, it was not to be expected that the business would be as prosperous as it otherwise would; but still, under all the circumstances, he thought he could see an improvement.

Mr. J. R. Peill and Mr. T. N. Stokes were re-elected Auditors for the ensuing year.

Mr. STOKES proposed a vote of thanks to the Chairman and Directors for their able management of the affairs of the Company during the past year. The Company was a small concern, and did not go on so well as they could all wish; but this was no fault of the Directors, who, he believed, had done their best.

The CHAIRMAN, in returning thanks on behalf of himself and co-directors, expressed his regret that Mr. Smith, one of their number, was not present, the reason being that, having lately suffered from the result of overwork, he was obliged to go abroad for the benefit of his health. As Mr. Stokes had observed, the Directors lost no opportunity of doing all that lay in their power to place the Company in a proper position, which he did not despair of attaining to ultimately.

The proceedings then terminated.

SINGAPORE GAS COMPANY, LIMITED.

The Annual Ordinary General Meeting of this Company was held at the City Terminus Hotel, London, on the 30th ult.—H. P. STEPHENSON, Esq., in the chair.

The following are the report and accounts presented to the Shareholders :—

The Directors regret they have to report that the progress of the Company during the last half year has not been so satisfactory as hitherto; the loss on exchange has been heavy, and the sales of coke have been very slack. The annexed report of the Engineer and Manager shows further particulars as to the working of the Company.

The Directors going out of office by rotation are—Messrs. Robert Stannard Foreman and William Henry Le Feuvre; and these gentlemen, being eligible for re-election, offer themselves for the support of the Shareholders. The present Auditors, Messrs. William Thomas Morrison and Alfred Williams, retire from office according to the Articles, and, being eligible for re-election, offer themselves to the Shareholders for that purpose.

The balance-sheet to Dec. 31, 1877, appended to this report, shows the financial position of the Company. The Directors have written off for depreciation of works and plant, and off the expenses of first establishment, as per balance-sheet, at the rate of 1 per cent. per annum. The profit for the half year, after writing off these sums, amounts to £1994 4s. 4d., which together with £653 11s. 11d., the unappropriated profit of the preceding half year, makes the available balance £2647 16s. 3d. Out of this sum the Directors recommend the declaration of a dividend at the rate of 7½ per cent. per annum, less income-tax, on the amounts paid up on the preference and original capital; the balance of £324 7s. 4d. to be carried forward to the profit of the succeeding half year; the dividend to be payable on the 20th of May.

Report of Engineer and Manager.

Gas-Works, Singapore, Feb. 26, 1878.

Gentlemen,—By the French mail which left Singapore on the 13th inst., I had the honour to forward you the accounts and statements showing the working for the half year ending the 31st of December last. I trust they will reach you safely, and will be found correct.

During the half year there have been several drawbacks, which have had a tendency to reduce the profits. In consequence of the depressed state of trade in the East, and particularly in Singapore, the consumers have economized the use of gas as much as possible, and several places which previously were large consumers of gas have been partially closed during the half year. The result is a slight reduction in the gas-rental compared with the corresponding period of the year 1876; although, as you may observe, there is an increase over the previous half year of \$86.63 dols.

The returns from the coke have been less than usual, from the cause mentioned in my last half-yearly report—viz., from there being a large quantity of fuel thrown on the market at low rates, by the salvage sale of the coal, coke, and cinders, resulting from the fire at the Tanjong Pagar Wharf in April last.



Another unfavourable item in the accounts is the loss on exchange, which amounts to £30.81 dols., on an amount of £3000 remitted.

The present half year has opened with brighter prospects, and at its close I hope to be able to report more favourably on each of these items.

The stock of coke which had accumulated during the half year has been sold for export; and I have entered into an arrangement with the Tanjong Pagar Dock Company to supply them with 40 tons of coke per month, for twelve months; so that there is every prospect that our coke sales will return to their usual satisfactory condition.

In the manufacturing department all is going on well. The loss of gas by leakage and the consumption on the works amounted to 12½ per cent of the quantity made.

The collection of rental during the half year has been satisfactory, the arrears having been slightly reduced in amount.

During the half year, 52 new houses have been fitted up, and 12 additional public lamps erected. A further number of lamps are ordered to be erected to light the markets.

In conclusion, I would say that I hope to lay before you a more satisfactory report at the close of the present half year.

(Signed)

E. J. WELLS, Manager.

## Dr.—Balance-Sheet, Dec. 31, 1877.

To Capital—		
£5 paid on 2,000 preference shares	£10,000	0 0
£5 " 10,572 ordinary shares	52,860	0 0
£2 " 25 " "	50	0 0
	£62,910	0 0
Debtore bonds	900	0 0
Sundry creditors	871	10 9
Insurance reserve-fund	86	6 6
Profit and loss	2,647	16 3
	£67,415	13 6

## Cr.—Balance-Sheet.

By Cash at bankers, London and Singapore	£922	8 8
Ditto in hands of Secretary	6	14 8
Bills receivable	2,000	0 0
Office furniture	114	14 6
Cost of works and plant, as per last statement	£35,099	15 3
Add extensions during the half year	391	2 6
	£35,490	17 9
Less depreciation at the rate of 1 per cent. per annum.	175	10 0
	35,315	7 9
Purchase of land	1,118	2 8
Retort account	1,107	9 3
Stock on hand	11,276	18 9
Amounts charged to capital for travelling expenses, rent, preliminary expenses, and interest on capital during construction	£10,840	5 11
Less amount previously written off	904	13 3
	£9,935	12 8
Less amount written off this half year, at the rate of 1 per cent. per annum	54	0 0
	9,881	12 8
Gas, meter-rental, fittings, and sundries under collection to Dec. 1.	2,680	12 0
Gas, meter-rental, &c., for the month of December, and gas for public lamps for the half year	2,991	12 7
	£67,415	13 6

## Dr.—Profit and Loss Account, from July 1 to Dec. 31, 1877.

To Coal carbonized	£2,106	2 5
Lime and oxide	20	0 0
Trade and general charges	421	10 2
Rent, rates, and taxes	112	1 0
Directors and Auditors	210	10 0
Salaries and Collectors commission	743	15 10
Wages	403	19 6
Interest on loans and debentures	268	15 9
Loss on exchange	726	10 10
Bad debts and allowances	94	16 9
Retort account	100	0 0
Meter repairs and renewals	38	8 4
Depreciation on works and plant, and expenses of first establishment written off	229	10 0
Balance—profit for appropriation	2,647	16 3
	£8,423	16 10

## Cr.—Profit and Loss Account.

By Balance at profit and loss, June 30, 1877	£2,950	1 5
Less amount declared as dividend, after deducting income-tax on, ordinary and preference shares	2,296	9 6
	£653	11 11
Gas and meter rental	6,197	0 2
Products, profit on fittings, and sundries	1,973	4 9
	£8,423	16 10

The CHAIRMAN: Gentlemen, I have to move that the report, with the balance-sheet attached thereto, be received, adopted, and entered on the minutes. First, as regards our capital account, compared with the corresponding half of last year, you will find that we have received £1373 more capital in shares; but we have paid off over £3000 worth of bonds. That, so far, is very satisfactory. We have about £530 more creditors; and, on the other side of the account, we have £1900 less cash. These are the prominent features of the capital account. As regards the profit and loss account, nearly all our items remain the same as before, with this exception, that our loss on exchange is £310 more; our gas and meter rental is £240 less; and our products, profits on fittings, and sundries, are nearly £300 less. This accounts for the difference in the balance-sheet which we submit to you on the present occasion. We have two disagreeable items—one is the item of exchange. During the last year we have lost nearly £1000 by exchange. Many men, with much more talent than I have, profess to be totally ignorant of the whole of the reasons for the fall in the price of silver; other men, with less talent than they, profess to know all about it; but I must admit, myself, that none of them have shown themselves to be true prophets; and, as I have told you on former occasions, the only thing we can do is to meet the disagreeable thing as it comes before us, and deal with it the best way we can. I do not see any prospect or probability of any immediate change; and, therefore, we must just "grin and bear it." Another disagreeable item is the reduction of gas-rental. But I think we may have hope as to this, for I presume all of you know that a depression in trade exists, not only here in England, but over the Continent and the whole world; and no doubt the reduction of rental has arisen from the extreme depression in trade, and in the shipping interest. That, in the last half year, up to June, we rather recovered from; and had I been comparing the gas-rental of this half year, with the gas-rental of the half year ending June, it would have shown an increase. Then I have referred to the loss in coke. That arises entirely from an exceptional circumstance. The large quantity of coal burnt and half burnt in the fire at the Tanjong Pagar Wharf having been sold by auction in the district, the whole place was inundated with cinders, half-burnt coke, and half-burnt coal, and for a time this entirely destroyed our coke market. I am, however, glad to say that we see some signs that this hostile operation against the sale of our coke is about to subside. I believe

that the majority of the cinders and burnt coke sold at the Tanjong Pagar Wharf are now very nearly consumed, and we are beginning to have a better trade for our coke, and a better price. Notwithstanding all these drawbacks, we are able to pay you the usual dividend; but no doubt those who have gone into figures will see that the amount we pay in dividend is about £300 more than the profit we have made during the half year. That £300 has been met out of the balance which we prudently, on a former occasion, brought forward; so that we are now able to pay your dividend, and still carry a balance forward, although not so large by £300 as the balance that was brought forward. With these observations, gentlemen, I have to move that the report, with the balance-sheet attached thereto, be received, adopted, and entered on the minutes.

Mr. FOREMAN seconded the motion.

Mr. SMITH said he observed that the interest on debentures and loans was equally as large, if not somewhat larger, than in the corresponding half year.

The CHAIRMAN explained that the reason for this was that, in order to clear off the debentures, the payment of the interest was anticipated. In order to make up the amount in the balance-sheet, some of the interest of the succeeding half year was included. This, however, would not appear next half year.

Mr. SMITH asked if the new issue of shares would really take the place of the debentures.

The CHAIRMAN said that it would, with this exception, that the amount raised on new capital, as compared with December, 1877, was only £1373, and £3000 worth of debentures had been paid off.

Mr. RICE said he observed that there were still 25 shares remaining with £2 paid on them. He was in hopes that these would have been struck off the balance-sheet.

The CHAIRMAN said no doubt they would be struck off the next balance-sheet. They were 25 shares taken at Singapore, and the gentleman who had them was away from Singapore at the time. They were not paid up now; but orders had been given to make the call, and they would have to be paid up.

Mr. HEWETSON said it appeared from the report that the loss of gas, by leakage and the consumption on the works, amounted to 12½ per cent. of the quantity made. He wished to know what proportion of that was consumed on the works, and what was the proportion lost. It appeared to him that it was a large item.

The CHAIRMAN said he could not afford the information; but if he were to give it, as his opinion, he would say that probably one-twelfth of it would be consumed on the works.

Mr. HEWETSON considered the leakage was very great.

The CHAIRMAN did not think it was very great for such a considerable district with mains, seeing they were foreign works.

Mr. HEWETSON still held the opinion that it was enormous, and demanded the attention of the staff at Singapore.

The CHAIRMAN remarked that in England it was thought a favourable circumstance if the leakage were under 10 per cent. in provincial Companies. The instances in which it was less were very rare.

Mr. HEWETSON said in the case of The Gaslight and Coke Company it was less.

The CHAIRMAN said that that was only within the last 18 months.

Mr. SMITH said he was interested in several Gas Companies, and he did not know any one whose leakage and condensation were less than 12 per cent. In all suburban and straggling districts the condensation was very large.

The CHAIRMAN remarked that if it were possible to transfer the City of London to Singapore, he thought a pledge could be given that the leakage of gas would be less than it was at present; but in the present circumstances—and he had had considerable experience in foreign and provincial Companies—he did not think 12 per cent. was an excessive leakage; although, perhaps, it could be slightly reduced.

Mr. SMITH said it was much less than he expected. If it had been 15 per cent. he should not have been at all surprised.

The motion for the adoption of the report was then put and carried unanimously.

The CHAIRMAN moved—"That a dividend be declared to the preference and ordinary Shareholders at the rate of 7½ per cent. per annum, less income-tax in both cases, on amounts paid up on their shares from the respective dates of payment to Dec. 31, 1877; such dividends to become payable on the 20th of May."

Mr. FOREMAN seconded the motion, which was carried unanimously.

The retiring Directors were re-elected, as also were the retiring Auditors. Ten guineas each, as in previous years, were awarded to the Auditors for their services.

The CHAIRMAN proposed a vote of thanks to Mr. Wells, the Company's Manager and Engineer, for the energetic and careful manner in which he had managed the affairs of the Company.

Mr. FOREMAN seconded the resolution, which was carried by acclamation.

On the motion of Mr. RICE, seconded by Mr. SMITH a vote of thanks was heartily accorded to the Chairman, Directors, and Local Committee at Singapore, for their able management of the Company's affairs during the past year.

The CHAIRMAN, in responding, said that the Directors had done their best in the past, and would endeavour to do so in the future. There had not been what he might call a very extraordinary success attending their efforts, but he thought they were eminently respectable. Their dividends kept at the respectable figure of 7½ per cent., and as long as they did that there was no reason to complain. If the Directors could see their way, carefully and clearly, to go a little above that at some future time, the Shareholders might depend upon it that it should be done in the interest of both parties.

Mr. FOREMAN proposed, and Mr. RICE seconded, a vote of thanks to Mr. King, Secretary and Engineer of the Company. The vote was carried unanimously.

Mr. KING, in a few words, returned thanks for the compliment.

The proceedings terminated with the usual vote of thanks to the Chairman.

OTTOMAN GAS COMPANY, LIMITED.—At the ordinary meeting, on the 18th ult., the Directors reported that the gas-rental for the year ending the 31st of December last amounted to £6578 14s. 3d., and the net profit (after paying interest on debentures) to £2095 0s. 10d., which, added to the balance brought forward, made the sum of £2523 16s. 11d. This sum the Directors proposed to deal with as follows:—First, in payment of a dividend of 7 per cent. on preference shares, and, secondly, of 2 per cent. on ordinary shares. They further proposed to write off from the preliminary expenses account £500, leaving a balance to carry forward of £518 15s. 8d. During the past year the Directors have paid off debentures to the extent of £1500, and they have made a call on the preference shares to the extent of £1000. The Board, deeming it expedient to fill up one of the vacancies occasioned by the retirement of former Directors, have invited Mr. Alexander James Dove to join the Board.



## ON THE ARRANGEMENT AND CONSTRUCTION OF GAS-WORKS.

By Mr. H. ELLIS HILL, A.I.C.E.

[A Paper read before the Civil and Mechanical Engineers Society, on Thursday, April 11, 1878.]

Mr. President and Gentlemen.—The subject of gas-making and supply is so large and important, that I have thought it best in this paper to treat in general terms of the arrangement and construction of gas-works, by way of introduction, to be followed, I hope, in future sessions, by papers from other members on the various special apparatus.

The use of coal gas for lighting and heating purposes, although now so general, is of comparatively recent growth, at the beginning of the present century being scarcely known; the wise men of that day prophesying not only its speedy departure, but also that terrible disasters would occur while it was in use; while a clever Member of Parliament said it would be an impossibility to get a light without a wick. Since then ideas have entirely changed, and now gaslight has become nearly universal, many millions sterling being employed in gas-works, giving occupation to thousands of men, and taxing the abilities and energies of many of our best-known engineers.

The first consideration in connection with the design of a gas-works is, of course, obtaining a suitable area and site; and this is of the utmost importance, not only as bearing on the first cost of the works, but also—and this is, perhaps, of still more importance—on the working expenses for manufacture, so long as the works may be in existence.

Having estimated, then, the requirements of the district, and the capacity of the works, not only to supply present needs, but also the probable quantity required within, say, the next ten years, an area should then be obtained large enough to contain the works, and also to allow for the probable extension, so that new buildings and apparatus may be conveniently added as required. This area should be easy of access by rail, and also, if possible, by water. A railway siding should run into the works, so that coal could be delivered directly into the coal-store, and empty trucks returned to the line with the minimum amount of labour. The works should also—and this would generally follow if near a river—be at a low level compared with the district to be supplied. Sometimes great difficulty is experienced, if part of the town is higher and part lower than the works, in keeping a uniform and constant supply to both parts. Gas, having a natural tendency to rise, would supply the higher levels; but the lower parts, unless supplied from a different holder, and under pressure, would often be without any. But, while it is of advantage to obtain a low level for the works, care must be taken that the district is not likely to be inundated by floods, as was the case at some large works I recently visited, where the utmost difficulty was experienced in keeping the flood waters from the retort furnaces.

The site having been decided upon, the all-important question of arrangement would then require that all the knowledge and ingenuity of the Engineer should be brought to its proper consideration. All the apparatus should be constructed and arranged so that the coal may be easily received in the stores, and then passed on from stage to stage until the purified gas is safely stored in the holder ready for distribution into the town mains.

Now, Mr. President, having briefly introduced the subject, it will probably be more convenient to the members, for the purposes of discussion, if, instead of laying down abstract principles and general formulae, I put before you model works I have designed for a town of a given size, and work out and describe the apparatus in the order of its procedure when gas-making, pretty much in the same way an engineer would have to do if called upon to design such works.

First in order and importance, as regulating the size of the whole works, is the retort-house and fittings. I have taken, in this instance, a town of 5000 inhabitants, and have designed the works to be fully equal to their present demands, and with space for easy extension to twice that capacity.

For small works of this size the retorts would be what are called single settings—that is, open at one end only, the benches being about 10 feet in length from front to back, and the retorts 16 inches in diameter. The house should be 30 feet clear span, and about 20 feet high to the wall-plate, covered with a slated roof on wrought-iron trussed principals, and well furnished with louvre openings for ventilation, the length of the house being regulated by the number and size of the retort benches. A space in front of the retorts, about 8 feet in width and the whole length of the benches, should be paved with fire-bricks on edge, laid with a gentle slope towards the furnace, so that water used in slaking coke may run into the ash-pit, the remainder of the house being paved with 4-inch flagging. The retorts may be either round, oval, or D-shape; the two latter give the best carbonizing results, but are not so strong as the round; so that in small works where there would not be many spare benches, the round ones would generally be preferred. The number of retorts required would be found by the following rule:—For a small town a fair allowance would be 1800 cubic feet of gas per head of population (so that for 5000 people 9 million cubic feet of gas) per annum. This, divided by 180 days—a number found to give a good practical result—shows 50,000 cubic feet as the average daily consumption; but as the heaviest day's make must be allowed for, this would probably be half as much again, or 75,000 cubic feet. Each retort would produce about 4600 cubic feet of gas per day of 24 hours. Thus 17 retorts would be required for the heaviest day's make. Add to this number 25 per cent. for repairs; the retort-house should, therefore, be constructed for 21 or 22 retorts. Supposing a bench to be set with seven retorts—a very good number—three benches would be required, or, perhaps, a preferable arrangement would be as shown on the plan—that is, two benches of sevens, one of five, and a smaller one of three retorts, thus giving increased facilities for regulating the make between the small consumption of mid summer and the heaviest winter's day, as a combination of either 3, 5, 7, 8, 10, 12, 14, 15, 17, 19, or 22 retorts may be used. The retorts are charged by means of a long scoop, with about 2 cwt. of coal, and allowed to carbonize between four and five hours—a good method being to give five charges per 24 hours. The gas, as made, is taken from the retorts by an ascension-pipe above the projecting mouthpiece, generally 5 inches internal diameter at the lower end, and tapering to 4 inches internal diameter at the top. The gas then passes at a considerable distance above the retorts through a cross, or H-pipe, and hydraulic dip, into the hydraulic main—a simple and beautiful contrivance for carrying off the gas. The main should be made, for lightness and strength, of wrought-iron plates, bent to the required shape—generally U section—having a flat cover, with opening to admit the dip-pipes. The main is generally carried by brickwork or brackets from the top of the benches. The lower portion of the hydraulic main is charged with tar and liquor at a sufficient height to immerse the lower end of the dip-pipe, and form a seal, so that the gas which forces its way, or is drawn, from the retorts cannot return. In some cases the hydraulic main is constructed in short lengths or sections, the gas and tar being taken off by a false main running parallel to it.

The retort-benches are constructed principally of fire-bricks, having a furnace below, with openings or flues passing round the retorts for the heated gases from the furnace to carbonize the coal in the retorts—a single

flue passing from the end to the main chimney stack. Through bolts are built into or over the stack, to prevent it splitting with the varying temperatures. Before re-charging the retorts, the residual coke is drawn out and slaked, part being used as fuel in the furnace, and the remainder stacked in a convenient place for sale.

In connection with this part of the works should be built the coal stores. The preferable way is to put the building parallel to the retort-house, and opposite the front of the retorts. The size would, of course, vary with the facilities for obtaining coal supply; but, in ordinary cases, a storage capacity equal to six weeks heavy consumption should be allowed for. The building should be so arranged that the full coal trucks from the railway could run in and drop their contents on to the floor of the stores, until the coal reached the level of the rails. It could then be thrown over the sides of the trucks on each side, and walled up to the level of the wall-plates. The lower part of the wall, between the stores and retort-house, should have openings through which coals could be drawn for use in charging the retorts. The building in the design has been shown 22 feet clear span, and the same height and length as the retort-house. The rails for the trucks would be carried on columns and girders for the length of the building, the top of the rails being 12 feet from the ground level, to allow loaded trucks passing under the tie-rods of the roof. The calculations for size of stores are very simple. Taking 75,000 cubic feet as the heaviest day's make, and a ton of coal as yielding 9500 cubic feet of gas, a day's consumption would be 7.9 tons by 42 days = 332 tons, at 43 cubic feet per ton, equals 14,276 cubic feet of space required for storage of coal. By having a large coal-store the works would not only be independent of fluctuations in the supply, but the coal would get thoroughly dry before being required for use.

The coal having been brought from the railway to the stores, and thence to the retorts, the products of carbonization—that is, the illuminating gas and its impurities, and the condensed tar and liquor—pass from the retorts through the hydraulic main to the condenser to be gradually cooled down to as nearly as possible the atmospheric temperature.

Condensers are of various designs; those known as surface condensers are the most general and the simplest in their action. These are of three well-known types; that is—

1. The series of horizontal, or nearly horizontal tubes, the lower ones immersed in water, in which the gas passes backwards and forwards from the top to the bottom, being gradually cooled in its passage by radiation through the metal of the tubes.

2. The vertical pipes, fixed on a rectangular iron box, in which the gas traverses alternately up and down through the series, until the temperature is sufficiently lowered; but perhaps the simplest and best form is the vertical annular condenser, consisting of a series of double tubes, side by side, with annular spaces between them. These tubes are fixed at the lower ends on to a rectangular box by short horizontal branch-pipes to the top, or by diagonal pipes from top to bottom. The gas from the hydraulic mains, passing into the annular space at one end of the condenser, is brought in contact with two cool surfaces—that is, the outer and inner tube, both exposed to the atmosphere. As the gas cools, the tar and liquor carried with it are deposited, and trickle down the sides and into the chamber beneath, and from thence to the tar-well, the series of tubes being sufficiently large to give the required amount of cooling surface. The advantage of this condenser is that a continuous current of air is kept up through the inner tube, caused by the cold exterior air forcing upwards the warmer air from inside the tube. In warm weather, if the condenser is exposed to the direct action of the sun, water may be allowed to play on the outside tube, to keep it cool; and in cold weather the inner tube may be closed, or partially closed, to regulate the supply of cold air. In calculating the size of condensers, it is usual to allow 150 superficial feet of cooling surface for each 1000 cubic feet of gas passed through per hour; so, for works of the size illustrated, that is 75,000 cubic feet for the heaviest day's make, or 3125 cubic feet per hour, a condenser with 470 superficial feet of cooling surface would be required, or say two condensers, each 2 feet 6 inches outside diameter by 18 feet high.

The next apparatus in order is the exhaustor, for drawing the gas from the condenser and passing it on to the scrubber, for lessening the pressure, and for preventing the deposition of carbon in the retorts. There are two distinct types of exhaustors in general use, the rotatory and reciprocating, each having advocates, the former, I believe, giving generally the better results. The rotatory exhaustor consists of two cylinders, the outer one fixed to a bed-plate, and having within it a smaller one revolving on a shaft set out of centre. Projecting from the small cylinder is a slide actuated by a pin working in a groove in the outer casing. As the inner cylinder revolves, the slide filling the space between it and the casing causes a vacuum behind, into which rushes the gas from the condenser, and at the same time the gas in front of the slide is forced on to the scrubber; the theoretical objection to this form being that they do not exhaust steadily, as the work done in similar times varies with the varying length of the diaphragm slide between the two cylinders. The reciprocating exhaustor is similar in principle to a horizontal blowing-engine, the piston of the exhausting cylinder being worked either direct from the end of the steam piston-rod, or by a connecting-rod from the crank-shaft; the action being, of course, the reverse of that in the steam-cylinder—that is, the piston causes in its travel a vacuum behind it, and the gas from the condenser rushes in, and at the return stroke is forced through what would be called the exhaust port of a steam-cylinder on to the scrubber. In single exhaustors of this type, the same objection would apply as to the rotatory type, but they are generally made with two exhausting cylinders, the pistons being driven by cranks set at right angles, so as to equalize the work done as nearly as possible to the traverse of the steam piston.

From the exhaustor the gas is passed to the scrubber, to remove the ammonia. The scrubber, as generally constructed, consists of a large upright cylinder with an inlet-pipe at the bottom and an outlet at the top. Shelves are arranged inside, covered with coke, tiles, brushwood, or other porous substance; or, as is probably the best plan, filled with thin boards set on edge and crossed in layers, the boards being about three-eighths of an inch thick, with about the same amount of space between. At the top of the scrubber is an apparatus for distributing water or ammoniacal liquor over the surface. This water or liquor, trickling down through the pores or spaces of the materials, absorbs the ammonia from the ascending gas. When coke is used it must be periodically renewed, as the pores get choked with impurities; but as far as I know this does not seem necessary with the boards, some scrubbers having been in work some years without requiring any change of filling. This stage of gas purification has become more important during the last few years because not only is an impurity taken from the gas, but a valuable article of commerce is obtained. A scrubber requires a capacity of 150 cubic feet for each 1000 cubic feet of gas passed per hour, and 15 gallons of water per ton of coal carbonized. So for works of the size now described the scrubber should be 6 feet diameter and 18 feet high.

In connection with the scrubber and condenser is a tar and liquor tank, into which the tar and liquor, distilled from the gas in the condenser and scrubber, pass for storage until sold. The tank, or well, may be of brickwork, concrete, or iron, sunk in the ground, the top being level with the



surface. The size should be equal to eight weeks storage, taking 25 gallons as the quantity yielded by each ton of coal carbonized. The size shown on the plan is 20 feet by 15 feet by 12 feet deep.

Following the scrubber are the purifiers, where the gas is completely purified before entering the holder. They are generally arranged in sets of four—three being in use and one at liberty for recharging—a centre-valve being placed between them to direct the passage of gas in any required order through the purifiers. The usual pattern of purifier is like a large box, constructed with cast-iron ribbed plates, bolted together and caulked at the flanges. Ledges are cast inside, on which rest wood sieves, covered with lime or oxide of iron. In the Metropolitan district, where the Act of Parliament is very strict as to the appearance of carbonic acid, lime is necessarily used in purifiers, either wholly or in conjunction with oxide; but in the Provinces oxide is very often the only material used. The cover of the purifier, which is removable, is made to pass over the sides, dipping into a recess nearly filled with water, acting as a seal to prevent the escape of gas. The gas from the scrubber is introduced at the bottom of the purifier, and, in passing through the purifying agent, parts with its carbonic acid and sulphuretted hydrogen, the process of purification being similar, whether the agent employed be lime, oxide, or a combination of the two. Taking, for example, a set of lime purifiers, in each casing would be an arrangement of sieves—generally four or five placed one above the other—each spread with a layer of slaked lime 3 or 4 inches in thickness. The gas entering from an inlet-pipe at the bottom, passes through each layer and down an outlet-pipe at the top, leaving a portion of its carbonic acid and sulphuretted hydrogen in combination with the lime. The gas then passes through the centre-valve to the second purifier, and then to the third, by which time it should have obtained the required state of purity. When the first purifier has become too foul for further use, the valve-cover is lifted and turned a quarter turn, the second purifier then becomes the first in order, and the spare one, which had in the meantime been refilled, brought into use, as the third one—the one that has now been thrown out of action—is emptied of its foul contents ready for recharging when required. When oxide is used, the sieves would be less in number, and have thicker layers. The great difference between the two systems is not so much in the action as in the residue, which, in the case of lime, becomes an intolerable nuisance while it remains on the works; and, although it is possible in country districts to sell it as manure, in large towns it is often difficult to get rid of it even by payment; while in the case of oxide, the spent material may be laid on the ground, and after turning over for two or three days is again fit for use. Before emptying a purifier, the cover has to be lifted and taken away. A very usual plan of doing this is to have rails supported on brackets running along the length of the house over the purifiers. On these rails is a traveller-frame with a traversing hand-crank or with a vertical screw, to which are slung four chains hooked into shackles at the corners of the cover, by which the cover may be lifted and carried over the next purifier. This method is only applicable where the weight of the cover is not great; but in large works where manual labour, both in lifting the covers and filling the purifiers, must be as much as possible dispensed with, different systems have been adopted. The latest and most complete arrangement of the kind for this purpose, and of which, by the kindness of my friend, Mr. Morley, of the Salford Corporation Gas-Works, who has also supplied me with much other valuable information on the subject of this paper, I am able to give particulars, is now being applied to some new purifiers, 30 feet square, at those works. In this case a line shaft runs along two sides and one end of the purifier-house, driven by a belt from an engine below, the lifting machinery for each purifier consisting of four square-thread screws, one at each corner, working in worm-wheel nuts, attached to the beams carrying the purifiers. Those wheels are actuated by worms on shafts alongside the purifier, the four shafts being connected at the corners by mitre gearing, so that when set in motion the four screws are simultaneously turned, and the cover raised to the required height. When high enough, four carrier-wheels are inserted into brackets on the cover, the screws are withdrawn, and the cover, running on wheels, is hauled along on the edge of the purifier on to the next one, a short rail being placed between them to make a continuous line. In connection with this apparatus is an arrangement for lifting the oxide and recharging the purifiers. Between each pair of purifiers is an elevator consisting of a series of iron buckets on links, forming a continuous chain, carried round a drum at the top of the house, the lower end dipping into an elevator-trough on the ground floor, into which oxide is tipped from barrows. When a purifier requires charging, the elevator is put into motion by worm-wheel gearing, and takes up from the oxide trough a continuous supply, delivering it into a hopper attached to a swinging shoot, so arranged that it may be brought over the centre of the purifier being charged, the attendant merely having to spread it evenly upon the surface. The whole of the machinery for lifting the covers and filling the purifiers is to be driven by an engine with a 10½ inches diameter of cylinder, and 24 inches stroke. The boiler will be 5 feet 6 inches diameter, 15 feet long, with 2 feet 9 inches tube. To calculate the size of purifiers, the simplest rule is, supposing there to be four to the set, three always in work—multiply the heaviest day's make in thousands by '6, for the superficial area of each purifier.

From the purifiers the gas passes through an instrument which, although having nothing to do with either the manufacture, purification, or storage, is an essential part of all well-regulated gas-works—that is, the station-meter for measuring and registering the quantity of gas made. Its construction is similar to an ordinary service-meter, but, of course, large enough to pass the total make of the works.

The gas now being made, purified, and measured has to be stored previous to distribution to the town. For this purpose a gasholder and tank are required.

The tank is generally a large circular pit, sunk in the ground, and lined with brickwork backed with clay puddle, finishing at the ground level with a stone coping. Until recently, except where iron tanks were used, brickwork was the only material used for tanks. But a few years since, Mr. Livesey, of the South Metropolitan Gasworks, who has had the honour of introducing many improvements into gas-works, constructed a concrete tank with a brick lining, and afterwards one entirely of concrete, and without any puddle backing, and with so much success that, I believe, concrete is destined, from its adaptability and cheapness, to supersede brick for this work. At one side of the tank is a recess to receive the inlet-pipe from the station-meter and the outlet-pipe to the street-mains. Bed stones are placed on the bottom of the tank to receive the runner guides for the holder, and at the coping for the columns or stanchions.

The general appearance of a gasholder is so well known as to need no description here. Its construction is, however, a matter of great importance, being a costly article, and requiring more skill to construct and erect than any other portion of gas-works plant. There are two kinds of holder—the single and the telescopic. The former cheaper as to first cost, but the latter, by taking up less ground, would probably be found cheaper in the end.

The holder shown on the plan is 54 feet diameter, double lift, each 17 feet 6 inches high, the plates varying in thickness according to position; the crown plate being three-eighths of an inch thick, the inner and outer

circles No. 13 Birmingham Wire Gauge, the remainder of the roof sheets No. 14 B. W. G., the top and bottom tiers of the sides No. 14 B. W. G., the others No. 15; rivets for the thin plates quarter of an inch diameter, 1 inch pitch. At the bottom of the inner lift is a cup to receive the dip of the outer lift; the cup and dip are similar in construction, but inverted in position, and may be made by rivetting to the shell of the holder, and to a vertical plate, a piece of channel iron or double-angle iron, or a plate may be bent to the required form. When in action the cup would be partially filled with water to act as a seal, to prevent the escape of gas between the lifts; the sides of the holder are generally stiffened by vertical truss bars to prevent the sides buckling when resting on the bottom of the tank; the cover is also, in most cases, trussed for the alleged purpose of keeping the crown in its proper shape when not distended by gas. This point, however, is now being warmly discussed, the result of which will, I think, be that trussed covers will soon belong only to the past; for it seems contrary to all ideas of correct designing that a heavy trussing should be attached to and carried up and down with the cover in all its journeying, and continually straining it, merely because it may be wanted to keep the cover in shape when the holder is empty, which could be more simply and effectually done by erecting a fixed light in the tank to receive the cover. The holder is kept in a vertical position by guide-pulleys running on guide-bars in the tank, and continued up the face of the columns.

For economical working, and for the peace of mind of the Manager, the holder should be large enough to contain 24 hours maximum make, and furnished with, say, one column to every 10 feet diameter of holder.

There is nothing very special about the ordinary column, except that it is specially unadapted for the work it has to do, and will possibly, in the future, give place to the light but stiff wrought-iron lattice column now largely used in America.

From the holder the gas is taken by an outlet-main through the governor—an apparatus for regulating the pressure—into the town mains and service-pipes, for use as required.

Within the boundary of the works there should, of course, be a manager's house and the necessary offices, stores, fitting-shop, &c.

I have made no particular mention of the arrangement of bye-passes, by which, on opening and closing different valves, the gas may be made to pass by, instead of through, any apparatus which may be temporarily disabled.

[The paper was illustrated with diagrams of the various apparatus and plant employed in gas-making; and also a model plan designed specially to meet the requirements of a town having a present population of 5000 inhabitants. A discussion followed, which was taken part in by the President, Messrs. Walmisley, Coates, Thorneioe, Bancroft, and Feeny.]

**QUALITY OF THE BIRMINGHAM GAS.**—Mr. Jackson reports that, during the month of April, at the four gas-making stations of the Corporation, he made 14 examinations of the illuminating power of the gas supplied to the Borough. The maximum light in sperm candles was 17·68; minimum, 15·79; average, 17·06. The Parliamentary standard is 15 candles, with Sugg's No. 1 "London" burner.

**COMPULSORY PURCHASE OF WATER-WORKS.**—A correspondent has added the following note to the information we recently gave from the *Northern Echo*:—"You mention the compensation for the compulsory sale of the Stockton and Middlesbrough Water-Works. It is worth while referring to the subject from a financial point of view. The maximum statutory dividend of the Company is a little over £18,500. They offered to sell it, so reports goes, for £550,000—at any rate for less than £600,000; but the Corporations persisted in fighting them by Act of Parliament. They got compulsory power of purchase—the first Act ever granted—but they had to pay 25 years purchase of the statutory dividend, *plus* compensation to be awarded by arbitration for compulsory sale and for prospective improvements. The Arbitrator has awarded £213,000 in addition to the £466,000, the 25 years purchase, so that the Corporations have to pay close upon 37 years purchase, besides taking over debts, &c.—a caution for future compulsory purchasers! The costs of the Act are estimated at over £60,000. The rateable value of the two towns is only £340,000."—*Financial Opinion*.

**NEWBURY WATER-WORKS.**—The public opening of these works took place on the 23rd ult. The Newbury Water Company were formed in 1877, with a capital of £20,000, in 4000 shares of £5 each. The source of their water is a well dug in the chalk in the valley at Northcroft, a short distance from the town. It is only 14 feet deep from the surface and 7 feet in diameter. It was originally intended to carry it down to a greater depth, but at the depth of 14 feet a strong spring was struck coming in from the chalk, and which yields from 20,000 to 34,000 gallons per hour. The well affords an instance of one of those peculiar springs which are occasionally met with in the chalk formation. On the 15th of May last year, this spring was struck in sinking the well, and was found to yield 34,000 gallons per hour at a depth of 1 foot 6 inches from the bottom of the well, the yield gradually diminishing to 19,320 gallons at a height of 5 feet from the bottom. It was at first supposed that this was the valley water coming up through the gravel, and samples were, therefore, submitted to the late Dr. Noad, F.R.S., who pronounced it to be pure chalk water, similar to that obtained from the North Kent Water-Works at Crays. Dr. Noad stated in his analysis that the water was somewhat hard, but as a beverage and for domestic use perfectly unexceptionable. From the well the water is pumped to a reservoir situated at Speen, at a height of 110 feet above the surface of the well. The pumping-station consists of an engine and boiler-house built of red brick, with strings of blue brick, and set off by ornamental stonework. The chimney shaft is about 40 feet high, and has an ornamental stone cap. At present there is only one engine and boiler on the works, but space is left in the building for another of each, which will be added when the increased demand for water renders it necessary. The water is lifted by four pumps, having cylinders 9½ inches in diameter, and 2 feet stroke. The pumps are driven by a vertical engine of what is known as the Grover "Britannia" type, having an overhead cylinder 12 inches in diameter, with 2-foot stroke. The engine is of 12-horse power nominal, and is supplied with steam from a Cornish boiler, 16 feet long and 5 feet diameter, with a flue of 2 feet 7 inches diameter. With this machinery, over 16,000 gallons of water per hour are lifted into the reservoir at Speen. This reservoir, which is not quite finished, is constructed of brickwork in cement, the sides sloping with a batter of 3 feet to 1 foot. It is to be covered in with brick arches, and is provided with a valve chamber, 10 feet by 6 feet. This reservoir is 42 feet long, 30 feet wide, and the height of the final water level in it will be 15 feet from the bottom; it is at present 10 feet. The reservoir is capable of containing about 110,000 gallons. The brickwork at the bottom of the walls is 3 feet 9 inches thick, working up to 2 feet 3 inches at the top, whence the covering arches will spring. The reservoir is situated at such a level as to command the whole of the town of Newbury, which has a population of about 10,000. Pipes have been laid down throughout the greater portion of the town, and the services are being rapidly put in. The supply will be constant. The Engineer of the Company is Mr. J. W. Grover, M. Inst. C.E.



## SULPHUR PURIFICATION.

Mr. F. J. Evans, a Director of The Gaslight and Coke Company, and late the Engineer-in-Chief of that Company, has, in conjunction with Mr. W. T. Sugg, Gas Engineer, of Westminster, just completed a patent\* for an invention, the chief object of which is stated by them to be "to effect the complete removal of the sulphur compounds contained in coal gas as it leaves the retorts, and thereby to increase the illuminating power of the gas."

In order to attain their object, the patentees propose to utilize the ammoniacal liquor produced in the distillation of coal, and to employ the ammonia derived therefrom as a purifier of the gas.

The removal of the sulphuretted hydrogen from the gas is, as is well known, a comparatively simple matter; but the removal of the bisulphide of carbon, or fixed sulphur compounds, has hitherto been the great difficulty with gas engineers.

In applying their invention to an established work, the patentees propose to jacket, if necessary, for the whole or a portion of their length, the pipes leading from the several retorts to the hydraulic main, or the pipe into which the gases generated in the several retorts are discharged, the object being to maintain the gas at a temperature of some 200° on its delivery to the hydraulic main. Into the hydraulic main, or its equivalent pipe or chamber, ammonia is admitted, either in the form of vapour or liquid, in such quantity that the carbonic acid and the sulphur compounds (sulphuretted hydrogen and bisulphide of carbon contained in the hot gas) will, as the gas is subjected to a washing process, become neutralized.

To obtain the ammoniacal vapour and solution, the gas liquor produced in the manufacture of coal gas is run into a boiler, and the ammonia compounds are driven off therefrom by the application of heat. These compounds, together with the steam generated, are led into vessels, such as are ordinarily used for the purification of gas.

Fig. 1 shows one arrangement for this purpose. A is a boiler for distilling off the ammonia, and a pipe leading from the boiler to the first purifier, B. This purifier is supplied with oxide of iron, and is connected by a pipe, c, with the second purifier, C, containing lime. The pipe, c, leads from this purifier to the first of a series of closed condensing vessels, D, which are partly filled with water. These vessels are connected

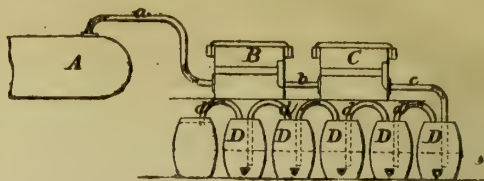


FIG. 1.

together by dip-pipes, *d*, which conduct the surplus ammonia from one vessel to the other. The ammonia as it enters the first vessel is taken up by the water contained therein, and when the water is saturated, the ammonia passes off to the second vessel, and so on to the whole series, saturating in turn the water supplied to the several vessels. A pipe leading from the last closed vessel dips into water contained in an open vessel, and when an escape of ammoniacal gas from this vessel is observed, the liquor from the condensers is drawn off, and a fresh supply of water is admitted to the condensers. The oxide of iron in the purifier B will absorb the sulphuretted hydrogen carried over with the ammonia, and the lime in the purifier C will absorb the carbonic acid. The ammonia thus obtained will be in the form of a strong caustic solution, and is then ready for use in the hydraulic main. The supply of this solution is adjusted to suit the amount of gas which is passing from the retorts. When sufficient ammonia is presented to the gas to neutralize the acid compounds, the gas will be deprived of the carbonic acid, sulphuretted hydrogen, and the bisulphide of carbon, or fixed sulphur compounds, contained therein.

When employing ammonia in the state of vapour, the lime purifier is connected with the hydraulic main or its equivalent, and the ammonia is thus brought into direct contact with the hot gas.

The apparatus employed by Messrs. Evans and Sugg, in effecting the purification of gas according to this invention, is one which has been subsequently patented by Mr. Sugg,\* of which the annexed engraving, fig. 2, is an illustration:—

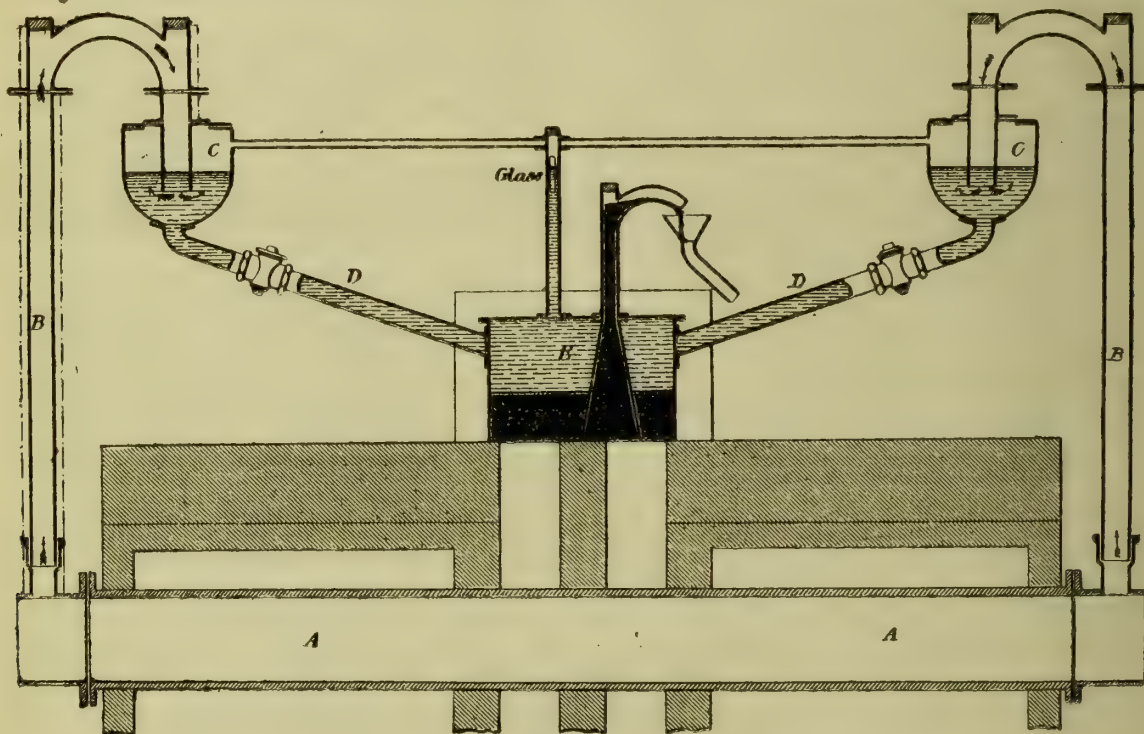


FIG. 2.

The drawing exhibits, in longitudinal section, one of a series of through retorts, A, fitted at its opposite ends with ascension-pipes, B, that lead to hydraulic mains, C, as commonly used in gas-works. These mains are connected by pipes, D D, with a vessel, E, into which the tar deposited by the gas in its passage through the hydraulic mains is discharged, instead of being allowed to accumulate, as at present, in the mains.

In connection with each of these hydraulic mains is an apparatus such as that shown in longitudinal sectional elevation in fig. 3, for subjecting the gas while in a heated state to the action of ammonia.

In this drawing, B represents the dip of one of the ascension-pipes, and C the end of the hydraulic main into which the hot gas from the retorts is conducted. F is an inclined chamber, divided by partitions, *f*, into compartments 1, 2, and 3, which compartments communicate with each other and with the hydraulic main by means of dip-pipes, *g*. These pipes are sealed by liquid ammonia, which is supplied thereto by a pipe, *h*, entering the compartment 3, the same being derived from the pumping apparatus described with reference to fig. 1. The compartments also connect with each other by openings in the partitions, *f*, near the floor of the chamber, and each compartment is fitted with an overflow-plate, *i*, which plates keep the liquor to the required level in the several compartments, and allow of the descent of the liquor as the supply is continued from the highest compartment to the lowest, and thence to the hydraulic main, from which it is discharged into any suitable receiver.

The gas, as it leaves the retorts, will retain its heat while passing up the pipes, B, by reason of such pipes being clothed with non-conducting material (such as is used for clothing steam-boilers), or otherwise protected from the cooling action of the atmosphere. The gas will thus enter the main at a temperature of some 200°, or in a condition best adapted for the efficient action of the ammonia thereon. It will then pass from the hydraulic main through the several compartments of the chamber, F, as indicated by the arrows, and in so doing it is caused to bubble through the ammoniacal liquor contained therein, leaving behind it the tarry products of the coal; the first discharge being, as before mentioned, into

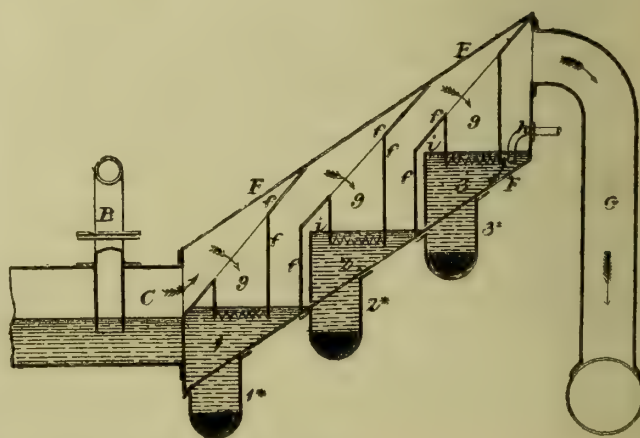


FIG. 3.

the vessel, E; the second into a chamber, 1\*, forming an extension of the compartment 1; the third into a chamber, 2\*, being an extension of the compartment 2; and the fourth (if any tar still remains in the gas) into the chamber, 3\*, of the compartment 3. Thus, no accumulation of tar is allowed to interfere with the free passage of the gas, and as ammonia is freely supplied to the chambers through which it has to pass, the removal of the carbonic acid and the sulphur impurities contained in the gas is ensured.

As the liquor becomes saturated with impurities, it is run off from the

\* Patent No. 3445, Sept. 12, 1877 (sealed Feb. 19, 1878), for "Improvements in the manufacture of coal gas, and in the treatment of ammoniacal liquor obtained in such manufacture."

\* Patent No. 103, Jan 8, 1878, for "Improved apparatus for purifying illuminating gas."



main, and is replaced by the downflow of purer liquor from the compartments of the chamber, F; a supply of pure liquid ammonia to that compartment being maintained during the process of purification. Connected with the compartment 3 of the chamber F is a pipe, G, which carries off the gas as it is purified, and conducts it to the scrubbers, where its temperature will be reduced, and it will be rendered fit to enter the gasholder. It may, however, be desirable to pass the gas through an oxide of iron purifier, in case the neutralization of the sulphur acids is not complete.

The patentees state that they have found, in carrying out the purification of gas according to this invention, that the gas derived from one ton of Newcastle coal will be thoroughly purified by passing the same while in a heated state through 120 gallons of ammoniacal liquor of the strength of 10 ounces of ammonia to the gallon. The gas, on leaving the chamber F, should not exceed a temperature of 100° Fahr.

For gas-works in which no hydraulic main is used, a modification of the above-described apparatus is employed, which is also adapted for the application of ammonia in the form of vapour, or it may be in the form of spray. This modification is shown in the annexed drawings, in which fig. 4 is a sectional elevation, and fig. 5 a plan of the same.

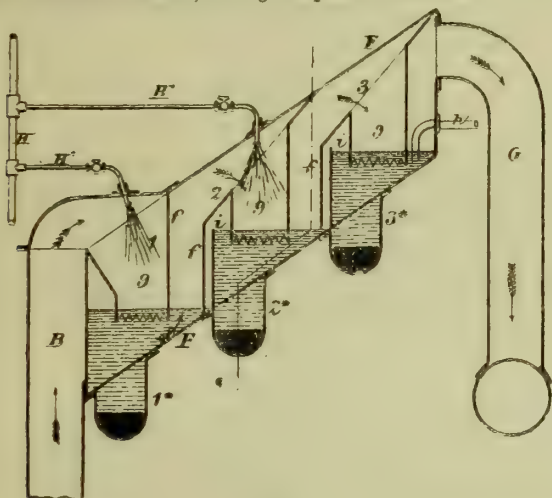


FIG. 4.

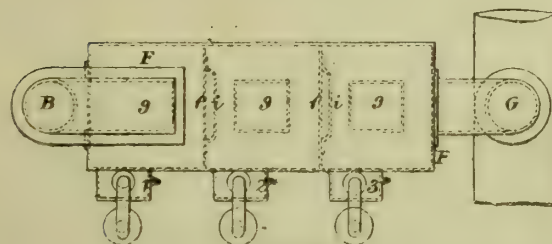


FIG. 5.

In this instance each ascension-pipe, B, is connected directly with the chamber F, which is in all respects, except in capacity breadthways, similar to that described with reference to fig. 3. A transverse section of this chamber is shown in fig. 6.

In this arrangement water is admitted by the pipe, h, and the ammonia is supplied from the pipes, H', which lead respectively into the compartments 1 and 2 of the chamber F. Thus the gas becomes commingled with the ammonia before passing into the liquor in the first compartment, and it is caused to yield up a large proportion of its impurities, after which its progress through the second and third compartment completes its purification.

Although describing the above apparatus as that which, by preference, they employ, the patentees state that they do not limit themselves to the use of any particular apparatus for bringing the hot gas into contact with ammoniacal liquor for the purpose of purifying the same, as the only condition requisite is that there shall be an ample supply afforded to the gas to ensure the neutralizing of the acid compounds, and the absorption of the same into the liquor. For the purposes of the invention, the well-known Livesey washer, a diagram of which is shown at fig. 7, may be employed.

The patentees claim as the special feature of their invention—first, subjecting coal gas while in a heated state to the action of pure ammonia in the gaseous or liquid form, in the manner and for the purpose above described; secondly, obtaining pure ammonia from gas liquor in the manner above set forth.

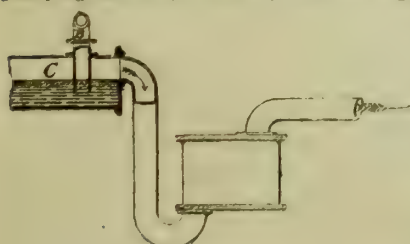


FIG. 7.

#### LEEDS CORPORATION GAS-WORKS.

We learn from recent numbers of the Leeds newspapers that at a meeting of the Leeds Town Council on Monday, the 1st ult.—the Mayor (Alderman Carbutt) in the chair—a motion was submitted by Alderman Bower, Chairman of the Gas Committee, for an increase in the salary of Mr. H. Woodall, the Gas Engineer. This motion was brought forward with the concurrence, and on the recommendation, of the entire Committee except one member, who, curiously enough, had, at the meeting of the Committee, himself proposed a similar resolution. After a long discussion, the proposed increase was negatived by the Council, by a majority of three only in a Court at which 51 members were present. It further appears that at a general meeting of the Gas Committee, held on Thursday, the 25th ult., Mr. Woodall laid before them a statement, and it

was resolved—"That the Engineer be authorized to send to each member of the Council a copy of the statement read by him on the work accomplished since his appointment."

We publish the document because it seems to us that few incidents could more forcibly illustrate the disadvantages under which corporation management of gas undertakings labour, than that it should be necessary to prepare such a statement. Mr. Woodall is to be congratulated that, under the provocation, he was able to present so eminently creditable an account of his stewardship.

The statement is as follows:—

Mr. Chairman and Gentlemen,—The failure which attended your kind attempt to secure for me, at the last meeting of the Town Council, the advance of salary which, as a large and most important Committee, you were almost unanimously of opinion I was deserving of, has induced in my mind a belief that the misfortune could only have resulted from want of information amongst those members of the Council not of the Gas Committee; and it is with a view of conveying to their minds some knowledge of the magnitude of the interests under your control, and of the responsible duties which fall to the share of your Engineer, that I ask you to allow me to submit the following brief summary of the work which has been accomplished since my appointment three years ago.

It will be in the recollection of most that, previously to my engagement, there was very general dissatisfaction throughout the town on account of the price, quality, and quantity of gas supplied; that the Gas Committee were unpopular, and that those who had promoted the purchase of the businesses from the Companies were charged with having made a disastrous bargain. It is further within my own experience that Counsel employed by Companies to oppose applications in Parliament by Towns Authorities desirous of securing possession of their undertakings, commonly used, as a strong argument on their side, the losses which had resulted from Corporate management of gas affairs in Leeds.

All this is now changed. There is an abundant supply of gas in every locality, the quality has been improved, and the price will shortly be as low as any in the kingdom. And, as a natural consequence, the good results achieved here are acting as a stimulus to Corporations to acquire similar privileges.

But it is not an uncommon impression, I believe, that this altered condition of affairs is attributable to the reduced value of coal. Permit me to show that this is by no means the case. The cost of coal, less coke sold, in 1875 was £61,559; in 1877 it was £50,732, or £10,827 less. Now, had the price of gas been the same in 1875 as in 1877, the loss on the former year would have been £14,010; whereas, in 1877, you showed a balance of profit of £8069, notwithstanding that you had expended on maintenance of plant, out of the revenue of that year, £15,578 in excess of the rate of expenditure in 1875. Summarized, the result is as follows:—

1875. Loss as above . . . . .	£14,010
1877. Balance of profit . . . . .	8,069
„ Extra expenditure . . . . .	15,578

	£87,657
Deduct difference on coal account . . . . .	10,827

Greater profit, apart from price of coal . . . £26,830

The foregoing comparison is confined to the years 1875 and 1877. During 1878 the saving due to the lower market value of coal, as compared with that of 1877, did not exceed £4000. Yet the Committee were enabled to make another reduction in price of 6d. per 1000 feet, or £24,000 per annum to the town. And now again, from an estimate which I have prepared, and which will shortly come before you for consideration, it appears that in the coming year you will be in a position to make a further concession in price of 3d. per 1000 feet, or £12,000 per annum.

These three reductions (supposing the latter to be approved) all dating since June, 1876, are equal to a gain of £60,000 per annum. But, in addition, there has been an improvement in the quality of the gas worth about £5000, and there has been an increased rate of expenditure, on maintenance, of £10,000 a year, so that the gross saving effected is about £75,000. Deducting from this sum £15,000 as due to the reduced market value of coal, there remains £60,000 a year as gain consequent on improved management since 1875; an amount equal to the gross income from our magnificent water-works.

Now, I have no desire to lay claim unduly to these results as accruing from my management apart from the Committee, of whose conduct in relation to the business I have frequently expressed my admiration; but I am sure that the members of the Committee would not hesitate to assert that very much is due to the ability with which I have worked upon my practical experience of more than 20 years.

What is due to me personally is, perhaps, more apparent in what I have not done rather than by what has been accomplished. For instance, it is known to the Committee that shortly after arriving in Leeds I was informed that it was necessary for me to prepare plans for a new gasholder, in accordance with the recommendation of the late Engineer. I was, however, able at once to assert that such an expenditure as that work would involve was inexpedient; and, at a cost of about £200, I met the requirement, and have never felt the need of additional storage to this day. A new gasholder would have cost about £15,000, and interest and maintenance at least £1000 per annum.

Economy in another direction is manifest in the construction of the new holder about to be erected in lieu of the one worn out in Dewsbury Road. For, if you double the present price of labour and material, to compensate for the greater cost at the date when the holder at Sheepscar was erected (an extreme estimate), there still remains a margin of £4 per 1000 cubic feet capacity in favour of the one recently contracted for; and, had similar economy been exercised in the construction of the Sheepscar holder, there would have been saved on that transaction alone not less than £5000. I venture to say that the same care has been given in every department of the diversified business under my management—a business which requires a capital of £1,000,000 sterling, which has an income of nearly £200,000, and the normal growth of which necessitates an expenditure on additional works of £20,000 a year.

I have thus briefly sketched out the gain which has resulted since my appointment. What has been my reward? A great increase in work, anxiety, and responsibility, and an absolute loss of £150 a year compared with the income I enjoyed in my previous situation! I came to Leeds proud of my appointment—than which there are not more than two or three so important in the provinces—confident of success, and equally confident that the sacrifice I was making at the time would shortly be recompensed. I need hardly say that the result of your appeal to the Council on my behalf was a disappointment to me; but I feel, nevertheless, that it is only necessary for Councillors to be informed as to the merits of the case to reverse their previous resolution, and to concede the very reasonable proposition submitted by a practically unanimous Committee, who, of themselves, are one-third of the Council.

At the risk of being considered tedious, may I say a word or two on the subject of leakage, which is often discussed in connection with our work?

The unaccounted-for gas in Leeds is now 1½ per cent. over 500 miles of



mains, about 80,000 service-pipes, and 60,000 meters. The length of mains, and other items enumerated, are greater, in proportion to the sale of gas, in Leeds than in any town that I am aware of in England. In Manchester and Birmingham, for instance, to about the same length of mains, and the same number of meters, there is fully double the consumption. Supposing, therefore, that all our customers were to double their consumption, it would not occasion the loss of an extra foot of gas to supply them; but the ratio of loss would be at once reduced to one-half of what it is at present, and would then be quite as low as obtains in either of the towns I have named. The subject is, however, receiving my earnest consideration, and I hope to be able to report considerable improvement on the coming year's working.

In conclusion, permit me to thank you Mr. Chairman, and the members of this Committee, for giving me such united and generous support at the last Council meeting. I assure you that I regarded your kindness as a very high compliment.

(Signed) HENRY WOODALL.

#### WATER GAS IN AMERICA.

Professor HENRY WURTZ, Ph.D., of New Jersey, has just presented to the President of the Municipal Gaslight Company, New York, the following report upon the Chemical Composition of the Gas manufactured at the Works of that Company:—

To Charles D. Frankland, Esq., President of the Municipal Gaslight Company, New York.

Sir,—Having been desired by you, in December last, to enter into a chemical investigation of the gas made at your works in 45th Street, I began such investigation about the 1st of January, and have been incessantly occupied therewith during the past two months.

As I stated to you in advance, your gas, in common with all others containing petroleum products, presents to the gas analyst certain difficulties which do not occur in the case of gas made from gas coal. These arise, as I then informed you, chiefly from the presence—long since maintained by me, in gas from petroleum—of a special series of hydrocarbon gases, generally believed not to exist in gas from coal, known as the "paraffin series"—*ethane, propane, butane, and pentane*. These hydrocarbons formed from petroleum, to which your gas, as I have since determined with precision, owes over one-fourth of its candle power, are not amenable to the absorbent action of sulphuric oxide, the agent employed for the "ethylene series," the illuminant hydrocarbons met with in ordinary coal gas analysis. With your gas it has therefore been necessary to try new processes, in the hope of solving this new problem. The processes I have devised and tested, though not as yet perfected, or as completely successful as I could wish, have nevertheless thrown valuable light upon the constitution of your complex gas, and have developed facts which I regard as of much interest, both to science and in practice.

A laboratory was fitted up by me at your works, adapted for ordinary endiometry as well as for my own peculiar class of methods (published three years since), called by me *Train Analysis*, or *Gravimetric Analysis of Gaseous Currents*; the only methods as yet discovered by which any success could be hoped for in work of this kind. In these new methods large volumes of gas are operated on, many hundreds or thousands of cubic inches, or even many cubic feet, instead of only a fraction of one cubic inch as in endiometry. The gas is measured before and after absorption of its constituents, by means of carefully regulated and corrected gas-meters, with far greater proportional accuracy than is practicable in a eudiometer. Moreover, in addition to the determinations by volume, the absorbents are contained in pieces of apparatus weighed before and after the absorption, so that the *weights* of the different constituents are likewise ascertained. The additional device was introduced into this research, of numerous and careful *density determinations* of the gas by the effusion method of Bunsen, before and after the action of the absorbents and passage through the meters, by which a new and valuable control is obtained of the direct determinations of volumes of constituents by the meters, as well as a knowledge sometimes otherwise unattainable, of the densities, in gaseous or vaporous form, of several important constituents.

Previous to the present research, I have made no successful application of this mode of gravimetric train-analysis to the determination of *illuminant hydrocarbons*; but I now find it in the highest degree valuable for this purpose, particularly with regard to the olefines. Trains were fitted up, in which the gas was first measured through a meter charged with glycerine, whose rate had been accurately ascertained, then passed, generally at the rate of about one cubic foot each two hours, through proper solid reagents in granulated forms, to remove traces of carbonic acid, sulphur, ammonia, and water, and then through a tube containing broken pumice, saturated with fuming sulphuric acid, which was weighed (together with a succeeding tube containing solid caustic soda to retain the volatile acid products formed), the gain in weight, together with the loss of volume, as found by subsequent passage through a similar meter, giving us both the volume and the weight of the olefines, with any naphthalene, acetylene, and benzole that may be present. Determinations of the *density* of the gas, before and after passage through this train—making due allowance for the minute impurities and moisture present—give other data for calculating both the weight and density of the olefines, &c. The gas thus deprived of olefines passes from the meter at the tail of the train into a small gas-holder constructed for the purpose, whence it can be taken for photometric, densimetric, or eudiometric experiments, or for passage through further trains. The results thus obtained with your gas of different dates may be stated as follows:—

Feb. 5.—On this day the first important analytical results were obtained, after spending some weeks in fitting up and testing apparatus and methods. The gas from the street-main was found to have a density of '7011, and a candle power of 24.48. On passing through such a weighed train as described above, for absorbing the olefines (with benzole and its homologues, acetylene and naphthalene\*), by means of the ordinary solution of sulphuric oxide in oil of vitriol ("fuming sulphuric acid"), the absorption by volume was found, by two experiments, each made upon 1.5 cubic foot of gas, to be 8.74 and 8.86 per cent.; the mean being 8.8 per cent. The gain in weight of the sulphuric oxide tubes (of which, for certainty, three were used in the train—the absorption, and consequent deep brown coloration, and evolution of heat, appearing in the first one only) was at the rate of 71.1 grains per cubic foot; the whole increase of weight of the train, including aqueous vapour, &c., being 79.36 grains per cubic foot. The residual gas, which still burned with a flame of considerable brightness, having been passed into the holder, was then conducted into the adjoining photometric room through glass tubes, and its candle power carefully determined to be 6.59. This residual candle power must, of course, be attributed to the class of hydrocarbon gases I have referred to above, the paraffin homologues, which, under these circumstances, are not absorbed by sulphuric oxide. To make doubly sure of this remarkable result, this sample of gas was again passed from the holder through the two meters,

with a fresh train intervening, made up of two freshly-charged sulphuric oxide tubes and their attachments. The two meters now moved together exactly, revolution after revolution, till the holder was empty; no absorption or coloration of the pumice appearing, and the gas burning at the tail of the train with the same luminosity as before. This first series of experiments having proved the accuracy of my anticipation, and the fact that a large proportion of the paraffin homologues exist in your gas, the investigation proceeded at once with all possible diligence.

Feb. 7.—New trains having been prepared, the former experiments were repeated with still more care. The gas from the street-main, with a density of '7032 (mean of three determinations), gave an absorption of olefines, &c., per cubic foot = 77.05 grains. The volume of these hydrocarbons, by five successive experiments, upon 864 cubic inches each, was 9.7, 9.8, 9.25, 9.86, and 8.9; mean = 9.5 per cent. of the gas. This residual gas possessed apparently somewhat more candle power than in the previous case; and again, on passing through a fresh train, was not in any way changed in volume or otherwise.

Feb. 13.—New and powerful trains, and other extensive arrangements, having been completed on this day, an elaborate series of experiments, including endiometry, densimetry, and photometry, were begun upon the gas of this date. The density determinations of the gas from the street-main were three in number:—

'6806

'6848

'6869

Mean, '6844

The total condensation in the train was 75.96 grains per cubic foot, including 74.19 grains of olefines, &c.; the volume of these latter being—as the mean shrinkage of a very large volume of the gas passed for the whole day through the train—9.29 per cent. The candle power was 24.32. It may as well be here stated that other photometric determinations were subsequently made by me, all with great care and precision, none of which have given me a result below 24 candles.

After absorption of the olefines, the density of the residual gas was—

'5929

'5968

'6006

Mean, '5968

Computation here proves that 1000 cubic feet of your street gas, at 60° Fahr., weighs 364,800 grains, or 52.11 lbs. avoirdupois, and contains 74,190 grains, or 10.6 lbs. of olefine hydrocarbons. The mean density of the latter constituents is found from these figures to be 1.5, which is somewhat higher than that of propylene (= 1.455), as well as of a mixture in equal proportions of—what are doubtless its chief ingredients—

Ethylene (Olefiant gas), density . . . . . = .968

Propylene . . . . . = 1.455

Butylene . . . . . = 1.940

Mean . . . . . 1.454

Four per cent. of benzole vapour (density = 2.7) in such a mixture would bring its density up to about that which was found. The above figure for the mean density of the olefine hydrocarbons (= 1.5) is computed from the loss of volume as shown by the meters, with the actual increase of weight of the tubes in the train. It is readily controlled—and the precision of this new system of gas analysis conclusively demonstrated—by computing it in another way, from the loss of volume, with the *densities* of the gas before and after passing the train. Thus:—The 90.71 cubic feet remaining after absorption of 9.29 per cent. of olefines from 100 feet, weighs by its density as found = '5968 × 533 × 90.71 = 28,855 grains (one cubic foot of air at 60° Fahr. = 533 grains). This, together with 175 grains of moisture, &c., also condensed, being deducted from 36,480 grains (the weight of 100 feet of the street gas computed from its density), leaves for the weight of the 9.29 volumes per cent. of olefines 7450 grains; whence we get again the density = 1.505. [It may be remarked that the densities of the olefine gases, as computed from the analyses of Feb. 5 and 7, were then a little higher—1.516 and 1.521.]

The Paraffins.—On this day, Feb. 13, experiments were begun, and continued for many days, with great labour, with the object of separating the gaseous paraffin homologues, proved as above to be largely present in this gas, by the action of bromine upon the residual gas, after it has passed the tubes containing sulphuric oxide. It is well known that marsh gas is not at all acted upon by bromine, unless in sunlight; but it is equally well recognized that all the other members of this homologous series are violently attacked, even in the dark, by this potent agent. Schorlemmer, Thorpe, and Young, and other chemists have described many of the products of these paraffin brominations. There appears a tendency to form dibrominated compounds of very high boiling-points. For example, the hydrocarbon *pentane*,  $C_5H_{12}$ , whose boiling point is about 86° Fahr. (and which is no doubt contained, as vapour, in your gas), forms the product  $C_5H_{10}Br_2$ , whose boiling point is as high as 367° Fahr.; and *butane*  $C_4H_{10}$ , which boils at the freezing-point of water, would form  $C_4H_8Br_2$ , the boiling-point of which would be about 345° Fahr. The latter is as yet unexamined. On the assumption that this bromination would be a simple matter of substitution of bromine for hydrogen, the only gaseous product being hydrobromic acid, trains were fitted up with flasks of liquid bromine, and provided with tubes of granulated pumice soaked in caustic soda, to absorb the gaseous acid, together with the excess of bromine vapour. These were kept from the light during action. On Feb. 13, such a train yielded, in a series of experiments on 173 cubic inches each, the following absorptions, per cent.:—5.1; 5.15; 5.2; 5.02; 5.03; 5.25. On a subsequent day, a similar train gave a series of closely agreeing figures, averaging 5.65 per cent. of the street gas.\* Before deciding upon the value of this method, however, it was necessary to make analyses of the residual gas after passing the bromine train. Such analyses (which, to save space, will not be quoted here) showed that there was during the reaction a large production of marsh gas, this being verified also by the fact that the density of the gas underwent very little decrease during the reaction. In the last case above, gas freed from olefines, of density '682 was reduced by bromine to '599 only. One conclusion to be drawn from these facts is this—that as no marsh gas can be evolved from any of its homologues, without expansion of volume, hence the condensation of 5 to 5.5 per cent., shown above, is necessarily less than the volume of paraffin gases condensed by the bromine, and thus this method may at least be regarded as indicating a minimum proportion of these hydrocarbons. It will be shown below that the denser paraffins cannot well be admitted to exist in your gas in a less proportion than 7 or 8 per cent.

The Water Gas. It was found impracticable to arrive at a full comprehension of the constitution of your gas, without most careful analyses and density determinations of the water gas, which forms its main constituent, by volume. Feb. 13 was one of the days on which samples were secured of the water gas for endiometry, and on which sets of most careful density

\* The amount of acetylene and naphthalene in this gas were found to be very trifling. That of benzole was more appreciable.

\* The quantity of bromine taken up was something quite surprising, being, in the neighbourhood of an ounce for each cubic foot of gas previously freed from olefines.



determinations were made, at intervals, during the time of running of the analytical trains. The mean densities were as follows:—

1. . . . .	4900
2. . . . .	4900
3. . . . .	4935

Mean of all. . . . . 4912

Eudiometry by explosion gave as follows:—

		Multiplied by the densities × '01.	
Hydrogen. . . . .	49.32	× '000693	= '0342
Marsh gas. . . . .	7.65	× '00553	= '0423
Carbonic oxide. . . . .	37.97	× '009674	= '3673
Carbonic acid. . . . .	14	× '0152	= '0021
Nitrogen. . . . .	4.79	× '0097	= '0465
Oxygen. . . . .	13	× '01106	= '0014

100.00 Computed density = 4938

The densities here used for the several gases are those adopted by Bunsen. Determinations of carbonic oxide, made by absorption with chloride of copper, gave, as a mean, 38.46 per cent. The closeness of correspondence of the densities, by computation and experiment, leave no doubt of the correctness of the above tabulated composition.

The Illuminating Gas.—Attempts to obtain, by direct determination, a precise knowledge of the composition of your completed illuminating gas, were found even more troublesome than had been anticipated. It was supposed that no difficulty would occur, for example, in direct determination of the carbonic oxide by chloride of copper, after passage through the train which abstracted the olefines. It was found, however, that the determinations thus made were too large, and included evidently a portion at least of the heavy paraffin hydrocarbons. It was even found that these denser paraffins were partly absorbed by fuming sulphuric acid, when introduced in liquid form into the eudiometer-tube over mercury; to account for which I can at present offer only the hypothesis that the sulphurous oxide, always largely produced by the action of the fuming acid on the mercury, has the power of combining with and liquefying some of the denser paraffins. It was only when the fuming acid was used after Bunsen's mode, as absorbed into a porous pellet or rod, without contact with the mercury, that results were obtained corresponding to those in the analytical train. Complex and roundabout methods were used, but none gave such satisfactory and consistent results as those which were founded partly upon careful determinations of the densities of the original gas and of the residue after absorption of the olefines. The first statement below is founded as much as possible upon direct determinations; the olefines and carbonic acid from volume and weight in meter and train, the carbonic oxide by direct absorption with chloride of copper after repeated treatment with liquid fuming acid in the eudiometer, the hydrogen and marsh gas by explosion of the residue from the chloride of copper, and the paraffins representing the minimum absorption in the bromine train.

		Densities × '01	
Hydrogen. . . . .	38.20	× '000693	= '0265
Marsh gas. . . . .	15.82	× '00553	= '0875
Carbonic oxide. . . . .	27.14	× '009674	= '2626
Carbonic acid. . . . .	10	× '0152	= '0015
Oxygen. . . . .	10	× '011	= '0011
Nitrogen. . . . .	3.35	× '0097	= '0325
Olefines. . . . .	9.29	× '015	= '1394
Paraffins (higher than C <sub>4</sub> H <sub>10</sub> )	6.00	× '0222	= '1333

Computed density . . . . . = 6844

It is to be explained that the computed density here, 6844, the same as found by experiment for the gas, is arrived at by assuming the density 2.22 as that of the minimum volume admissible for the paraffins. The computation is, therefore, to be regarded as a determination of the maximum density possible for the paraffins. With the assumption for the latter of a larger volume, diminishing the marsh gas proportionally, their density will fall below the incredibly large figure, 2.22. The paraffins which, doubtless, make up the bulk of those present are—

		Densities.
Ethane. . . . .	C <sub>2</sub> H <sub>6</sub>	1.04
Propane. . . . .	C <sub>3</sub> H <sub>8</sub>	1.522
Butane. . . . .	C <sub>4</sub> H <sub>10</sub>	2.0

The next one, pentane (C<sub>5</sub>H<sub>12</sub>), has the boiling-point 86° Fahr., only 10° below that of ether, and ought, therefore, to be present in comparatively small proportion.

The next table given presents what I believe to be a much closer computation of the composition of your gas, of the date Feb. 13. Those constituents whose proportions differ from the above, were arrived at as follows:—Your Engineer stated to me the net amount of naphtha introduced into your gas per 1000 feet, as four gallons. A sample of this naphtha, obtained from him, had a density of .694 (water = 1). The four gallons weigh, therefore, 161,920 grains.

100 cub. feet of gas, of density 6844, weigh 36,480 grains.  
Deducting 0.4 gallon of naphtha. . . . = 16,192 "

We have the weight of the water gas in  
100 cubic feet. . . . . = 20,288 grains.

By the density of the water gas = 4912,  
its volume computes to 77.44 cub. feet in 100.  
Adding the known volume of the olefines = 9.29 " "

The sum is . . . . . = 86.73 cub. feet in 100.

And deducting from 100, we get the sum of all the paraffin homologues (including the marsh gas), derived from the naphtha = 13.27 cubic feet in 100.

If now for the denser paraffin homologues (called, for simplicity, "paraffins") we assume a figure which gives them a density much more within bounds = 7.5, we get for the marsh gas derived from the naphtha, which is to be added to that contained in the water gas = 5.77 cubic feet. These data give us, for the total composition—

		Density × '01	
Hydrogen. . . . .	38.05	× '000693	= '0261
Marsh gas. . . . .	11.85	× '00553	= '0655
Carbonic oxide. . . . .	29.40	× '009674	= '2811
Carbonic acid. . . . .	10	× '0152	= '0015
Oxygen. . . . .	10	× '011	= '0011
Nitrogen. . . . .	3.71	× '0097	= '0360
Olefines. . . . .	9.29	× '015	= '1394
Paraffins. . . . .	7.50	× '01735	= '1301

6814

Giving for the density of the denser paraffins = 1.735; a figure which even yet seems higher than can be admitted as probable, but which can only be reduced, in accordance with the fixed data of the problem, by

increasing the proportion of the denser paraffins, an increase which must necessarily be deducted from the marsh gas, falling upon that only.

In further prosecution of eudiometric and other work, further analytical results were copiously obtained, up nearly to the close of the month of February; inasmuch that time has not yet permitted the computation of a number of the analyses made. They were all generally confirmatory of the above conclusions, and hence it is not deemed necessary to swell this report with many additional figures. I shall therefore cite here only one more result; an analysis of the water gas of date Feb. 27, which differs quite considerably in some respects from the water gas analysis previously given, and may have been the product of a lower heat in the generators:—

Hydrogen. . . . .	55.14	× '000693	= '038
Marsh gas. . . . .	3.04	× '00553	= '017
Carbonic oxide. . . . .	35.35	× '009674	= '342
Carbonic acid. . . . .	18	× '0152	= '059
Nitrogen. . . . .	6.08	× '0097	= '002
Oxygen. . . . .	21	× '01106	= '003

Computed density . . . . . = 461

The density figures, as obtained by experiment on this day, were 461, 459, 450, 453, 453, 457, 453, and 455; the mean of these eight being = 455. This is a little lower than the computed density, which may possibly be due to a slight over-estimation of the nitrogen in the analysis. One per cent. less of nitrogen brings the computed density quite down to that found by effusion.

#### Analysis of Municipal Gas by Others.

My attention was called by you to certain figures published in the *American Gaslight Journal*, at the time my own analyses were in progress, which claim to represent the composition of the gas served out to consumers by the Municipal Gas Light Company. As these figures are in almost every respect obviously irreconcilable with my own, it is certainly incumbent on me to present the reasons which I readily recognize for pronouncing them inadmissible.

These figures are as follows:—

Hydrogen. . . . .	24.89
Marsh gas. . . . .	25.99
Carbonic oxide. . . . .	27.34
Carbonic acid. . . . .	'33
Oxygen. . . . .	'56
Nitrogen. . . . .	4.57
Olefines. . . . .	16.32

100.00

One important criterion which I have indicated in this report cannot be applied by me at present to these figures, namely that of a comparison of the density, as determined by experiment, with that computed from the figures; the authors having failed to state the density. Nor do they mention the date of their sample of gas, which would have enabled me to ascertain the density from the record kept at your works.

There is, however, another criterion which I find to be conclusively applicable to this case, and which shows at once that some fatal fallacies must have pervaded the methods by which these figures were arrived at. It may be laid down as a rule regarding all gases made like yours—a rule which, when once stated, will be conceded as obvious by those who possess but rudimentary chemical knowledge—which is, that the total oxygen-volume represented in the products cannot exceed half the total volume of the free hydrogen. That is, the oxygen cannot be in excess over the proportion contained in water, which is the source of all the oxygen except accidental traces. In point of fact, the conditions of the case compel that the free hydrogen in such a gas shall be quite largely in excess of the oxygen represented in all forms, or much more than double the volume of the latter. This is because a large proportion of the oxygen proceeding from the steam is converted into carbonic acid, and being abstracted by the water in the washers, and by the lime in the purifiers, cannot appear, in any form, in the gas. It also requires a very appreciable amount of the oxygen of the steam to oxidize the iron (and partially the sulphur) of pyrites in the coal, another reason for a necessary deficiency of this element. It seems quite probable that some further proportion of free hydrogen may also arise from decomposition of the naphtha in your retorts; but this latter may be only matter of supposition. The former reasons for an excess of hydrogen, however, are absolute, and cogent beyond all dispute.

If now we add together the oxygen shown in the above figures (from the *American Gaslight Journal*), we obtain:—

For the carbonic oxide, half its volume . . . . .	= 13.67
For the carbonic acid, its own volume . . . . .	= '33
For the free oxygen. . . . .	= '56

In all . . . . . = 14.56

While half the hydrogen volume present is but 12.45.

This chemical impossibility being encountered on the threshold, I feel compelled to submit that further critical examination of these figures would be waste of time and space. Otherwise, a discussion of the methods used would develop at least some reasons for regarding the results with great reserve. It must suffice to mention that these authors believe that the paraffin or marsh gas homologues are all unattacked by bromine.

#### Remarks upon the Composition of the Gas.

It is first to be observed that my analyses fully confirm the fact of the existence in your gas of one-fourth at least of carbonic oxide, a constituent which has been of late pronounced in certain quarters to render your gas dangerous as an illuminating agent in households, by reason of a putative poisoning of the air of rooms supplied with it. In a preliminary letter on this subject, addressed to you, I have already pronounced this an imaginary danger. Your gas has a very marked odour, even more so than that from gas coal; and no leak or emission could occur, sufficient to produce a dangerous impregnation of a confined atmosphere, without alarming the sense of smell—in cases of persons possessed thereof—to an intolerable degree. It is a familiar circumstance, contingent upon the use of all illuminating gases, that accidents will happen, especially to sleeping persons. Your gas will not increase such dangers, which can only be averted by reasonable care. The record clearly supports the assertion that even pure carbonic oxide is little, if any, more poisonous to animals than ordinary gas from gas coal. Illuminating gases have for many years been largely in use, in many parts of the civilized world, made from wood, peat, lignites, rosin, fatty oils, bark, and cork; all of which are highly oxidized substances, and often produce gases containing much more carbonic oxide than yours. Yet neither fact nor fancy ever supported an accusation against these as being "extra-hazardous" to health or life. Wood gas, for example, which is quite a common manufacture, contains sometimes more than 40 per cent. of carbonic oxide; and peat gases often contain nearly as much. From this point of view, the harping upon this accusation, of a new and terribly deadly agent being palmed upon the public, suggests such a partizan animus as might arise from "conflicting interests" endangered. No accumulation of citations of vague and crude opinions, stereotyped through generations of school-books, as to the danger of small per centages of carbonic oxide in air, should have any influence on reasonable minds, when it



is only by rare accident or stupidity that even these small per centages can be communicated to the air of a close room. To impart to the air of a small bed-room, of 1500 cubic feet capacity, if it should happen to be hermetically closed, the one per cent. which is stated by some to be fatal to *small animals* (though statements conflict much on this head), would require that a burner emitting 4 feet per hour of your heavy gas—which would be a 5-foot burner for common coal gas—should remain wide open for some 13 hours; much longer than any ordinary night's sleep. And proof remains to be produced that 1 per cent. of carbonic oxide will poison, narcotize, or even permanently injure, a human subject, while there is plenty of evidence that such a 5-foot burner, emitting coal gas in such a room, will produce, and has produced insensibility, and even led to the death, of occupants thereof.

There is to this question, however, another important aspect, which has not as yet received any adequate attention; but an aspect which is brought up to me strongly by the figures of my analyses. *Occasional injuries* and dangers arise, from leaks of mains and gas-pipes, with any gas; but there is another circumstance constantly arising from ordinary gas illumination, which is not occasional, but perpetual and unavoidable. This is the contamination, or rather *devitalization* of the air of close rooms by gradual abstraction of its oxygen. It is now well understood that the balance of normal oxygen absorption by the human blood is so delicate that very serious disturbances arise from quite minute variations in this respect—such, for example, as follow upon the slight variations of tension accompanying barometric changes. Many gas-burners in a confined space, in time, produce an effect on the air which even persons of the strongest nerves and circulations cannot defy. This is an ever-recurrent cause of debility, and a nightly morbid influence, to which multitudes are incessantly exposed. Anything which will mitigate this unavoidable evil should commend itself to public attention. I have already indicated to you, in a previous communication, that of the two constituents of an illuminating gas—marsh gas and carbonic oxide—the latter is far preferable, in regard to this highly important matter of air consumption. Marsh gas requires for combustion, indeed, *four times as much oxygen* as carbonic oxide, the latter being in this respect on a par with hydrogen. My analyses indicate, in your gas, a proportion of marsh gas so much lower than has heretofore been supposed, that I feel justified in claiming this as a development that has well rewarded the time and labour expended.

One further point, that should tell to the advantage of your gas, with the (unprejudiced) public, is that by reason of the greater density and consequently slower diffusion of your gas, *explosive mixtures* will be much longer in forming, through leaks; and dangers of this sort must needs be lessened. As between carbonic oxide and marsh gas, again, explosions of the latter, *ceteris paribus*, are far more violent than of the former, for the reason that marsh gas contains four volumes of hydrogen condensed into one. Marsh gas is the terrible “fire-damp” of coal-mines, whose explosions have destroyed so much human life. It will, I presume, be conceded, as a matter of fact, that dangers, losses, and fatalities from *gas explosions* are beyond all comparison more serious than cases of suffocation. This new suggestion will thus be seen to have great practical weight.

#### Conclusions.

I would sum up my two months incessant and laborious study of the chemistry of your gas as follows:—

1. The Municipal Gaslight Company are serving out to consumers a gas of uniform quality, which compares in brilliancy, whiteness, and other qualities of light with the finest cannel gas, while destitute of any fuliginous or smoky properties, as well as of any liability to condense by ordinary cold; its illuminating power for 5 feet per hour, measured by one of the test-meters of the American Meter Company, being uniformly up to *twenty-four candles* during my experiments.
2. This gas, in the case of equal leakage, will not be more dangerous to health than gas from coal; and, by reason of its higher density and less liability, therefore, to leakage under equal pressures, it will, I believe, be less dangerous in this way than gas from coal.
3. By reason of the greater density of this gas, its diffusive tendency through air is less, and it will hence be slower than coal gas in forming explosive mixtures with air, even in case of equal leakage.
4. On account of its far smaller proportion of marsh gas, the violence of the explosions of equal volumes with air will be much less, and the introduction of your gas will therefore reduce risks both to life and property.

Hoboken, March 4, 1878.

HENRY WURTZ.

#### LIGHTING BY ELECTRICITY.

[Translated from the *Journal des Usines à Gaz*.]

We give to-day, from the *Bulletin de l'Association Scientifique de France*, a résumé of the lecture delivered at the Sorbonne, on the 9th of February last, on the subject of the Electric Light, by M. Jamin, Member of the Institute, and Professor at the Polytechnic School and at the Faculty of Sciences, adding, at its conclusion, a few observations of our own. We shall not speak of the formation of the *Compagnie Parisienne d'Éclairage par l'Électricité*, as the controversy on this subject would fill our columns. It is, however, interesting in more than one respect, and we strongly advise gas shareholders to make themselves acquainted with it through the medium of the financial papers. We have no doubt whatever that they will keep their money in their pockets.

M. Jamin's lecture was as follows:—

Forty years after the discovery made by Volta about the year 1813, one of the most illustrious of English chemists, Humphry Davy, performed a memorable experiment. He took two red-hot carbons, which he extinguished in mercury, pointed them, and, having fixed them to the *rhéophores* of a pile, placed them in contact. The points became heated to a red heat; he then drew them apart, and saw produced between them a slightly convex flame, which he called the *electric arc*. It possessed a brilliancy comparable to that of the sun, and its temperature was so high that platinum melted in it like wax. This arc could be produced in a vacuum as well as in the air, its size could be increased to 10 centimètres (4 inches) by drawing back the conductors, after which it went out, and could not be re-lighted except by again putting the carbons in contact.

This magnificent experiment necessitated a very large pile; besides, Davy not thinking of making it the principle of a new system of lighting, this idea was not conceived and realized until considerable progress had been made in the art of producing electricity. Sufficient advancement has been made, however, by this time to allow the electric lamp to take, in point of economy, the first place in lighting on a large scale. The hall in which we are assembled is illuminated by 14 electric focuses, equal altogether to 1400 Carcel burners. I venture to assert, and you will not contradict me, that never was there illumination more beautiful, more inoffensive, more agreeable to the eyes, and more favourable for colours. It is supplied to us gratuitously by two Companies—that of MM. Denayrouze and Jablochkoff, and that of M. Lontin, rivals before the public, and rivals also in the eagerness they have displayed to appear before us. Let me first of all, in my own name as well as in yours, offer them our thanks; I shall afterwards explain in a few words the processes employed for deve-

loping the new light, and make a systematic analysis of its good qualities and its defects.

It is no longer Volta's pile that provides us with the current; we obtain it from machines based upon induction. The illustrious Faraday discovered that a coil of isolated copper wires, rolled upon soft iron, becomes the seat of a current of induction, very short, but very intense, when it is brought near the poles of a magnet, and that another current, inverse to the first, and like it instantaneous, yet more intense, is afterwards developed if the coil is suddenly drawn away. Very soon after this discovery was made, Pixii and Clarke invented the first electro-motors. Clarke's apparatus consisted of an electro-magnet which turned rapidly before the poles of a magnet, and was traversed at each revolution by two induction currents from contrary directions, sufficiently strong to cause very great commotion. It was only necessary to multiply the coils, enlarge them, and increase the power of the magnets, in order to obtain the electric light. This is what was done successively by several inventors, among whom may be specially cited Nollet, Gramme, and Lontin. [The Professor here briefly explained the principal known magneto-electric machines.]

It was not sufficient to have constructed magneto-electric machines; it was still necessary to regulate the light of the arc. In fact, the carbons consume away very rapidly, not only because they burn in the open air, but because the material of which they are composed is carried away by the current, and shifts from one point to another. An apparatus called a “regulator” was thereupon contrived. It consists of a very delicate mechanism, by means of which the carbons, though being continually brought near to each other by a spring arrangement, are at the same time held back by a lever attracted by an electro-magnet. If the current diminishes or ceases altogether by the separation of the carbons, the spring brings them closer together again; if, on the contrary, it increases by the contact of the carbons, the lever draws them away to a distance which remains nearly constant.

This problem of the regulation of the currents was felt to be of such importance that a legion of inventors sought for and found its mechanical solution. There are, therefore, a large number of regulators in existence, the productions of Duboscq, Foucault, Serrin, Gramme, Carré, Lontin, and others. M. Serrin's regulator is the one most generally employed.

Notwithstanding all the care bestowed upon their construction, regulators still leave something to be desired, inasmuch as their action is not continuous. The carbons remain at rest up to the moment when the distance between them attains a determined limit, after which the mechanism brings them suddenly together again, thus causing a more or less sensible alteration of the light, which, occurring at frequent intervals, very seriously interferes with its steadiness, and constitutes what has up to the present time been the greatest obstacle to the employment of electricity.

While mechanicians were looking for this regulator, a young Russian officer, M. Jablochkoff, discovered the means of dispensing with it altogether. Having been kindly admitted into the studio of M. Bréguet, he invented the “candle” which bears his name. Let us imagine two cylindrical parallel carbons, placed vertically, separated by a plate of gypsum, and simply connected at the top by two points. When the current is made to pass from one to the other, the arc is seen to burn at the upper extremity, and descend little by little as the carbons are consumed. It then reaches the top of the gypsum plate, which melts, disappears in smoke, and the destruction of the carbons taking place simultaneously with that of the gypsum, the candle burns slowly and steadily from top to bottom. The simplicity and perfect regularity of this new system, which has at one blow got rid of the unsteadiness of the light, will be readily understood.

We will now turn our attention to the arc, and the best way of studying it is to throw its image on to a white screen. It is not very clear, because it is enlarged, and on account of the light being diffused in all directions, rendering the image visible from all parts of the hall. We see that the carbons become very brilliant, that they are perfectly white, that the positive is more luminous than the negative, that the former diminishes while the latter increases, thus indicating a transference of the carbonaceous matter in the direction of the current. The space left between these two carbons is occupied by a flame much less intense, of a violet tint, animated by a tumultuous transporting movement, and traversed from time to time by sparks of matter carried away by the current. There is no doubt that the current is carried over by the carbonaceous matter itself, spread out in vapour between the two conductors. It is these carbons and this arc, in their entirety, that emit the electric light, the properties of which we are about to study.

First of all we must measure its lighting capacity. It is said that two lights are equal in quantity when, placed at the same distance, they give an equal amount of illumination. If, in order to be equal to the first, we have to withdraw the second to double the distance, thus reducing its illuminating power to one-fourth, we conclude that at an equal distance this second light would give four times the amount of illumination. And so we have the general rule that the quantities of two lights are in direct ratio to the distances at which they have to be placed to obtain equal luminosity, and the measure is taken by means of photometers, a description of which need not here be given. It has been agreed to compare the various quantities of light with that of a Carcel lamp burning white, and consuming 40 grammes of colza oil per hour. We shall, therefore, say that a light is equal to 10, 15, or 100 Carcel burners, in order to express that it sends the same amount of luminosity to the same distance as 10, 15, or 100 lamps of the type chosen, and with which we are going to compare the electric light.

Of all the tests of the illuminating value of the light, I shall take that of which the accuracy will be the least contested—one conducted with every precaution by a master of the application of mechanics, M. Tresca. He found that the light furnished by a Gramme machine was equivalent to 1850 Carcel burners. This number is enormous, and its enormity surpasses the proportions our minds are in the habit of comparing. A more exact notion would be conveyed by saying that in order to obtain the same amount of light it would be necessary to burn in one hour 78 kilogrammes (172 lbs.) of oil, or the bulk of gas contained in a balloon 9 mètres (30 feet) in diameter. Now, it is this enormous amount of light that we obtain from an electric focus. It is said that it is not necessary, that it exceeds our wants, and that, being indivisible, it will be rather a trouble to us than a benefit. This is an error, for it is divisible. First of all, it was divided by M. Leroux. Then smaller machines were employed, which reduced the regulator to 75 burners. Finally, M. Jablochkoff is able to place in the same circuit a very large number of candles, among which the light is divided, each being equal to 50 gas-burners. He can place 37 candles upon the current above cited, and by the aid of the following artifice has gone still farther. He prepares some condensers of very large surface, with sheets of tin separated by layers of silk, and then connects the two armatures with the extremities of a machine giving alternate currents. It is evident that the electricity of each current is first of all condensed and then replaced by the contrary electricity of the opposite current, the result being a modification of the composition of the currents furnished. What that modification is, is a point which merits attention



that it has not received. However, it is always the case that by breaking the circuit at a certain point, sparks surrounded by a very pale yellow flame are given off, the whole being accompanied by a peculiar rumbling sound, constituting one of the most beautiful experiments in electricity.

So much for science; now for its application. If a current is capable of lighting four candles of 50 burners, the same current, when acted upon by the condensers, can supply double the number—namely, eight candles, each one equal, not to 25 burners, but to rather more. We must not seek to push the division farther. The new light must progress; it must not simply replace one Carcel lamp, but must surpass it. The light could, however, be still further subdivided by lighting some rods of carbon, or, as M. Jablochkoff does, a thin plate of kaolin. [These experiments were described in detail.]

It is not solely on the score of quantity that the light of the arc is superior to all the other lighting focuses, but also for its brilliancy. Given two luminaries of the same extent, affording the same amount of light of the same brilliancy, if one furnishes twice, three times, or four times as much light with an equal extent, there is a brilliancy equal to twice, three times, or four times that of the other. Brilliancy may, therefore, be thus defined: The total amount of light conveyed by the unit of surface to the unit of distance, and the light of the Carcel burner may be taken as unity. Now, according to a learned treatise published by M. Allard, Engineer of Lighthouses, we find that the brilliancy of the arc is at least 600 times as great as that of the flame of a Carcel burner. The eye readily appreciates this difference. In fixing the value of the electric light, he saw it surrounded by divergent rays forming a kind of halo, and could find no other term of comparison than the sun. M. Fizeau, in fact, compared it to the sun itself for photographic purposes, and found that its power was as 38 to 100. And when powerful machines are employed, it is found that the sun and electricity are about equal, and that in reality the Titans of the nineteenth century have snatched fire from heaven without being precipitated for it into the unfathomable abyss. Is this immense brilliancy an advantage? When we have looked at the electric light, we see before our eyes various coloured spots which pursue us persistently, even when the eyes are momentarily closed. These are well-known facts, and I shall not assert that they are not injurious. One of the most learned physicists of Belgium, M. Plateau, lost his sight entirely after having employed it for a considerable time in the contemplation of the prismatic colours. It is with the electric arc as with the sun; we can receive its light, but we must not look at it.

The remedy for these defects is very simple. Surround the light with an opaque globe and you cease to see it; it is, however, transmitted to the globe, in its passage through which its intensity is lowered, and in proportion to the opacity of the globe so will the brilliancy of the light be modified, and consequently less dangerous to the eyes. It is true that this necessitates a considerable loss of the original light; but where there is so much wealth we can well be lavish.

I now come to the most important point of my subject—namely, to study the composition of the electric light. Since Newton's time we have known that solar light is composed of an assemblage of rays, which, by means of the prism, we are able to separate and classify in the order of refrangibility, from red to violet. There we have arranged, in perfect order, all the simple colours possible—those which, by their combinations, reproduce all the others. The light given by lamps or gas, when analyzed in the like manner, is resolved into the same colours in different proportions; the red, orange, and yellow being very prevalent, but little green, scarcely any blue, and no violet. It is a very incomplete light, tending strongly to the red side, but weak or *nil* on the violet; and therein lies the secret of its inferiority.

The electric light is rather the contrary; not because it is not wanting in a single ray, but because, when compared with sunlight, it possesses rather more blue and much more violet, the latter arising from the arc. Reduced to its carbons, it would conform exactly to the sun. It is this predominance of the most refrangible colours, notably blue and violet, that justifies all the charges brought against the light; and we shall now see that this defect may be corrected.

Not only does the spectrum spread between the red and violet, but goes even beyond it, and from both sides rays project which, though invisible to our eyes, are really there. Those which extend beyond the red are heat rays, of which there are an enormous number in the light emitted by lamps, but scarcely any in the electric light. This light, therefore, is not hot. The rays which extend beyond the violet do not exist in the spectrum of lamp light; in the electric light they abound, and it is these that produce photographic pictures. If they are received upon sulphate of quinine, or a solution of the bark of the chestnut tree, they are transformed into luminous rays; they were not visible, but become so. The violet rays share this property; they may all be transformed into white light. It follows that the defects in the composition of the electric light may be corrected—that it suffices to eliminate the excess of blue and violet rays to filter the light through sulphate of quinine, and it then becomes absolutely identical with the solar rays. Gas and lamp flames, on the contrary, are wanting in these blue and violet rays, which nothing can possibly give them.

Let us now approach the question of expense. Everything entails expense in its production. We ask for light from motors; what is the cost of this transformation? Foucault one day made that remarkable and celebrated experiment which consists in causing a disc of metal to revolve between the poles of an electro-magnet. As long as the latter is not magnetized, the disc may be impelled at great speed, and does not cease revolving for a very long time, and then only slowly. As soon as the iron is magnetized, currents are generated in the disc, which stops suddenly. The production of these currents requires an expenditure of labour, and, in order to keep up that production, it is necessary to lean heavily upon the crank-handle—in a word, to employ force, which is transformed into an electric current. In my laboratory I perform another experiment. I attach a Gramme machine to a Hugon gas-engine of 3-horse power. So long as the circuit is open the motor gives to the machine a speed of 1000 revolutions, without fatigue, and almost without expenditure of force. As soon as the conductors are re-united, a current is developed which requires labour. Then the motor moves slowly and with difficulty, and we feel that considerable resistance has been imported into the working of the instruments. We see great motive power transformed into electricity, and from it we may infer that this wonderful thing we call "electricity," about which we know so little to-day, but which will certainly be better understood to-morrow, is only an actual form of movement accomplished in matter or in ether. It is a problem of which the solution is near at hand. In its turn this form of movement that we call "electricity," undergoes a second transfiguration in the electric arc, in order that it may become another kind of movement—viz., heat and light; so that if we take away the medium to which we owe this double transformation, we may say that the motive power is transformed into light.

But if the labour of this motor first of all changes into electric labour, this latter should, in turn, be capable of being converted into motive power. Well, couple together two Gramme machines, and set the first in action by means of a crank, and throw its current into the second; the latter will begin to move; and this experiment shows us that motive

power expended, for instance, at Havre, where it would be taken from the sea, might be transmitted to Paris, and there produce its effect. But we are still very far from realizing that dream.

Now, if the question is asked, "How much does the electric light cost?" it will be sufficient to say how many horse power its production necessitates. Now, Tresca's 1850 burners required 7-horse power, or 0.4 horse per 100 burners. If the light of only 100 burners were produced by the machines, 1.5-horse power would be required. It is a light that costs less the more you produce of it at one time.

Finally, if we are asked how many francs 100 Carcel burners will cost, it will suffice to reply that they require, on an average, one horse power, and calculate the cost of a horse. But to this must be added the price of the apparatus, the interest on the money invested, sinking-fund, maintenance, cost of supervision, &c. And here comes in the art of making figures give the reply we wish to have. M. Fontaine, in a remarkable work, affirms that the electric light, in equal quantity, costs 75 times less than gas. M. Fontaine is an electrician. On the other hand, a pamphlet which I have before me proves that the electric light costs 1 fr. 65 c., when that of gas costs 1 fr. only. This pamphlet is reprinted from the *Journal des Usines à Gaz*. On both sides there is exaggeration—one party wishes to conquer, the other to hold its position. Do not think that gas is menaced. That marvellous system of lighting which penetrates everywhere, lights our streets so admirably at dusk, cooks our dinners, and illuminates our guests—which is always present and always ready to work—this system of lighting, I say, has no rival, no enemy but itself—the high rate at which, to its misfortune as well as ours, it has been fixed by an unintelligent monopoly. Gas has before it an immense domain to conquer; private houses to light, kitchens to warm, and the old-fashioned chimneys to supersede. In the place of this future, what will the few luxurious establishments do that electricity will conquer and hold? Nothing but create a great need of light, a need which the gas companies will be called upon to satisfy. Far from losing by the electric light, they will gain; far from complaining, they will rejoice at it; well inspired, they would place themselves at the head of the movement which they could not resist.

And, after all, which is the dearer, gas or electricity? This is my sole reply: The Lontin Company offer, under penalty, to provide all the apparatus, lamps, carbons, and everything required, and supply the light at the rate of 50 centimes per hour for 100 burners, on condition, be it understood, that the light is to be taken for a long term, and that a definite number of burners are to be supplied. In this room there are 14; the cost of light for a lecture of one hour's duration would therefore be 7 frs.

Although this lecture may have already lasted too long, I must at last come to the real subject of it—lighting. The trials that have been made up to the present time have left such unhappy recollections, that they have affected, and still affect seriously, the new system. If we notice daylight, we see, in cloudy weather, the whole sky lighted by rays coming from the sun. These rays are projected in all directions, and strike the ground, buildings, trees, and other objects upon the earth; there they are very widely diffused, cross each other in all directions, and furnish at all points a general illumination. If you notice a spectator in the midst of this picture, you will see that he receives rays from all points, which thus become visible to him, and you will also notice that he sends back other rays in all directions, which in turn render him visible. Such is the natural arrangement that we have to imitate.

We must first of all imitate the sky; that is to say, we must concentrate at some point near the ceiling a great bulk of light, which is to be distributed over the persons present. To do that we must multiply the burners, conceal them from direct view, and, above all, cover up windows, shop-fronts, and glass roofs. It is by these outlets that the exterior light enters, and the interior light escapes. Such are the rules that have been found to work so successfully at the Magasins du Louvre, and equally so in this hall. I was yesterday passing along the Quai de la Monnaie, and from there I saw, over the Pont Neuf, the beautiful light at the Belle Jardinière illuminating and bringing out the architecture of this palace of industry. A little to my left rose, in desolate obscurity, a black and shapeless outline. It was the Louvre; and I asked myself if our ediles had not a duty to discharge towards our monuments and towards ourselves—namely, that of surrounding us with light, when it might be done so easily and so cheaply.

M. Jamin attributes the difference in the estimates of the net cost of the electric light to the various interests engaged either in gas lighting or in lighting by electricity. But M. Jamin, who is a great *savant*, might, it seems to us, have given some more precise information—something capable of enlightening his audience. He limits himself to saying that 100 burners require, on an average, one horse power, and that it is sufficient to calculate the cost of one horse; but he also says, "to this must be added the price of the apparatus, the interest on the money invested, sinking-fund, maintenance, cost of supervision," &c. Well, that is precisely the question. It is impossible to produce anything whatever without investing capital, for which interest has to be paid and a sinking-fund provided. Did not M. Regnault prove, in a celebrated report, that gas only cost 2 centimes per cubic metre? Yet, although he was for 22 years Consulting Engineer of the Paris Gas Company, he never indicated by what means gas could be produced at that price. That was because he had simply taken into account the raw material. How many millions were sunk and lost before gas returned any profit on the capital invested! This *unintelligent monopoly*, as M. Jamin ought not to have called it in a scientific lecture, now lights the City of Paris gratuitously, and many other cities and towns for ridiculously small sums. Is the electric light capable of doing as much? No. And why? Because the capital invested in the gas industry has been sunk progressively, and as the consumption has increased on a large scale, the general expenses have been distributed over a large number of cubic feet of gas; this divisor increasing more rapidly than the dividend, the quotient—namely, the net cost—diminishes. It is by relying upon this arithmetical operation that the electricians succeed in establishing very low cost prices. They set their machines at work, produce the light of 100, 200, or 1000 Carcel burners, and divide the cost per hour by the number of burners; the quotient, which is as small as the number of burners is large, constitutes the net cost.

Let us, for example, take the lighting of the amphitheatre of the Sorbonne by means of 14 electric lights, equal altogether to 1400 Carcel burners. It is evident that, by taking no account of the first cost of the motor, the electro-magnetic machine, the wires, and the lamps, the cost of these 1400 Carcel burners was small—7 frs. (5s. 10d.) for a lecture of one hour's duration, according to M. Jamin. But in the course of the year the lectures extended over perhaps as many as 30 hours—let us say 100 hours, to be quite over the mark—and let us put down 15,000 frs. only (£600) as the cost of fitting up; we arrive at the sum of 150 frs. only (£6) to add to M. Jamin's 7 frs., while the lighting of the amphitheatre by gas costs really 2 fr. 20 c. (1s. 10d.) per hour (44 burners at 5 centimes per hour), without any addition whatever.

A trial of this kind has been made in a brewhouse at Lyons. The contractor for the electric light undertook to light this brewery for a month at the same price as was paid for gas (7 frs. per night), and give a much more



intense light. At the end of a month's reciprocal gratification, the electrician proposed to the man of commerce to purchase the fittings and apparatus at a considerable sum. The latter gentleman did not take long to make his calculation, and has simply returned to gas lighting.

M. Jamin says that M. Jablochkoff can place 37 burners on the same circuit. We are quite willing to believe him, but should be much more curious to see it. Of one thing we may satisfy ourselves at the Place de l'Opéra, where there are eight electric lights, and that is, that each of these lights is furnished with sixteen wires.

We have only seen practically four Jablochkoff candles burning upon the same current; but sixteen have been worked with the same Gramme machine in the dye-works of M. Bredin at Lyons. In that case, however, a little subterfuge was resorted to; there were four Gramme machines attached to the same shaft, that is to say, four distinct currents, and consequently four canalizations of copper wires. It is nevertheless true that the experiment made at Lyons with the machine which was afterwards used at M. Jamin's lecture frightened the small holders of gas shares, and in a few days those of the Lyons Company dropped about 100 frs. But there is nothing to fear; these shares have gone into the hands of those who are more confident in the future of gas, which is in no way compromised by the new light. *It is not all gold that glitters.*

#### THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The strike in the Lancashire cotton trade continues to throw a considerable quantity of the inferior descriptions of fuel upon the market, some of which, from the Wigan district, is being pushed at extremely low prices, and any advance in slack, which is usual at this time of the year, is also being kept back by the same cause; colliery proprietors, indeed, being scarcely able to maintain late rates. With this exception there is no material change in the market, list rates, as a rule, being unaltered. There is, however, a great deal of pressing for reduction, with underselling, amongst needy holders, and prices have a downward tendency, a reduction so far as the Manchester market is concerned being very probable at the end of this month.

The better classes of round coal are now very hard to sell, and there is a great deal of short time being worked, very few of the pits now working more than about four days a week. Forge coal continues a drug, and engine classes of fuel are at present meeting with only a very small inquiry. The average quotations at the pit mouth remain about as under:—Best Wigan Arley, 9s. to 10s. per ton; common ditto, 7s. 6d. to 8s.; Pemberton four-feet, 7s. 6d. to 8s.; common coal, 5s. 6d. to 6s. 6d.; good burgy, 4s. 6d. to 5s.; and good slack, 3s. to 4s. per ton. Where, however, sales are pressed, prices are very irregular, and it is difficult to say what figures are being taken by needy holders, who are compelled to seek for orders in the open market.

For shipping the demand is still extremely small, and colliery proprietors who have to depend largely upon this branch of trade are pushing for orders at very low prices.

The iron trade continues in a very depressed condition, and prices are weak. Lancashire makers of pig iron, although nominally adhering to list rates, are open to offers at lower prices, and merchants, during the past week, have been pushing north country iron in this district at lower figures than ever. Consumers, however, are not to be tempted by low prices, and, in the present unsettled state of affairs, will only buy for their more pressing requirements. Finished iron is without change, Lancashire and Middlesbrough bars, delivered into the Manchester district, being quoted at £6 2s. 6d. to £6 5s., and North Staffordshire ditto at £6 5s. to £6 7s. 6d. per ton; but makers are not firm, and the selling prices are very much governed by the nature of the specifications offered.

#### THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The gas coal trade was not so strong last week for best qualities, and the quotations in the market do not exceed 7s. per ton. Gas coals are being shipped to Sweden and the Baltic ports, and the Russians are laying in stocks to meet contingencies. The falling off is in the coasting business principally, but that is usual at this time of year. There is an active inquiry for best steam coals, which trade is very much better, and some sorts of second-class gas have been sold for bunkers to be used on board steamers. The shipping trade of the Tyne and Wear was a good deal excited last week on account of the extraordinary demand for Cronstadt. Rates rose £4 per keel on Monday, and on Saturday they were quoted at about £11 per keel ready loading. There was also an advance of between £1 and £2 per keel to the Mediterranean. Coasting freights have been stronger. They were quoted on Saturday at 4s. 6d. to 4s. 9d. London for steamers, with a rise to all the other coasting ports in proportion. There is a scarcity of small steamers at present; coal freights are likely to be pretty stiff over the next fortnight, at least.

The exciting war rumours are having a bad effect on the general manufacturing trade. The chemical market is extremely flat, and prices fell considerably last week. Fire-bricks and all material of that sort are little inquired after, and are sent abroad in very limited quantities indeed. There is no change in the iron trade.

#### TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The street gas-lighting season at Dunoon having come to a close, an average has been taken of the consumption of gas at those public lamps which are provided with meters; but, notwithstanding the strenuous efforts of the local advocates of the principle of paying by meter for the gas consumed, the result has been shown to be about 15s. 6d. per lamp, as against 13s., which was the rate at which the Gas Company offered to supply the street-lamps during the season. To the 15s. 6d. must be added the cost, erection, and repair of the meters, without taking into consideration the consumption of the shoe-leather and time of the Gas Committee of the Police Commission.

At their last monthly meeting, on the 1st inst., the Dundee Gas Commissioners agreed to accept of a number of tenders for the erection of the new workshops, coal stores, purifier shed, lamp stores, &c., which they resolved upon proceeding with some time ago.

In order to meet the cost of the local gas-works purchased by the Town Council of Dumfries, under the provisions of the Burghs Gas Supply Act, an arrangement has been entered into for a loan of £25,000, at 4½ per cent. interest.

An annuity of £7 10s. of the City of Perth Gas Company was sold by public auction on Wednesday last at £192.

In his report on the illuminating power of the gas supplied in Glasgow during the week ending the 27th of April last, Dr. Wallace states that the lowest minimum was 25.59 candles (northern district), and the highest 28.08 candles (western district), while the average ranged from 26.69 candles to 28.95 candles, and the maximum from 28.09 candles to 29.92 candles. The western district had the best results over the week.

The annual general meeting of the Innerleithen Gaslight Company was

held last Thursday—Mr. Dobson, Chief Magistrate, presiding. The Secretary submitted the Directors report for the past year, along with the statement of accounts and balance-sheet, which were approved of. After making due provision for depreciation on the works and plant, and carrying forward a sum to the reserve-fund, a dividend at the rate of 8 per cent. per annum was declared, and the price of gas was reduced from 6s. 8d to 6s. 3d. per 1000 cubic feet.

Already a scarcity of water is beginning to be felt in the town of Oban, and a number of families residing beyond the burgh boundaries have had their supply cut off.

The closing prices in the Glasgow pig iron market last Friday were 31d. per ton under those of the previous Friday, and 2d. under the lowest for twelve years back. During the afternoon 49s. 10½d. cash and 49s. 10d. cash were paid.

In the coal market there is a tendency towards increased depression. Nominally, quotations are unchanged.

COCKERMOUTH AND WORKINGTON WATER-WORKS.—It is stated that the scheme for supplying these towns with water from Crummock Lake will entail a cost of £28,000, in 3600 tons of piping and castings; and the work is to proceed at once.

GAS CONSUMERS STRIKE AT BARCELONA.—A paragraph in some of the daily papers states that "the strike of the consumers at Barcelona against the Corporation continues. At dusk all the establishments, except the *cafés* druggists, &c., are closed. These are lighted by candles or lamps."

GODALMING WATER COMPANY.—The first general meeting of this Company was held on the 29th ult.—Dr. Brown in the chair. The Secretary reported that shares to the amount of £3250 had been already taken up, and that a large number had since been applied for.

LEICESTER GAS COMPANY.—A meeting of Shareholders was held on the 29th ult.—Mr. Hutchinson in the chair—for the purpose of considering the provisions of a Bill now before Parliament, entitled "A Bill to invest in the Mayor, Aldermen, and Burgesses of the borough, the undertakings of the Leicester Gas and Water-Works Companies, and other purposes." After some conversation, a formal motion approving the Bill was adopted.

VISIT TO THE BATLEY CORPORATION GAS-WORKS.—On Saturday afternoon, April 20, about 30 members of the Batley Field Naturalists Society paid a visit to the Batley Corporation Gas-Works, Soothill, and were met by Mr. Eastwood, the Engineer and Manager, who conducted them over the works and explained the different processes in the manufacture of gas. Mr. Eastwood appears to have been desirous not only to explain the mysteries of the works themselves, but also to convey some interesting and useful practical lessons to his guests, as members of the general community and gas consumers in the district. For example, whilst in the testing-room, Mr. Eastwood exhibited a number of burners, showing the results obtained from each, remarking that however good the gas sent out to the public might be, it was of little use unless they had good burners, and this was clearly demonstrated to every one. Mr. Eastwood had a number of burners fixed which had been used recently in some of the shops and churches in Batley, and on the same table were exhibited some new burners, such as he had been supplying to the public for months past at a cost of one penny each, and their immense superiority was clearly seen. Mr. Eastwood concluded his description of the works by illustrating the action of the governor used for regulating the pressure at which the gas is supplied to the public, and explained how injudicious it was to work at a heavy pressure, but that plumbers and persons building houses, and even mills, put in too small pipes, and consequently it required a greater pressure to drive the quantity of gas required through them, thus increasing the quantity of gas lost in the public streets by reason of broken or defective pipes, and causing a great loss to the public at large, because a few persons would not be at the expense of putting in proper pipes. He stated that in the end it would be to the advantage of the Corporation to put the gas-pipes into buildings for nothing, rather than continue the wasteful and ruinous practice of supplying gas at a heavy pressure in order to save the pockets of a few. At the close, Mr. Seth Smith moved a vote of thanks to Mr. Eastwood for his kindness in showing the party through the works. Mr. I. Binns seconded the motion, and, in doing so, referred to the fact that since the gas-works became the property of the Corporation, they had been so well managed that the very handsome sum of nearly £6000 had been handed over to assist the rates, or, to put it in homelier shape, each cottage householder had received half-a-crown a year as dividend since the works were purchased. Mr. Eastwood suitably responded, and the proceedings terminated.

FARNWORTH AND KEARSLEY GAS COMPANY.—At the half-yearly ordinary meeting of Shareholders, held on Wednesday, April 24—Mr. J. Greenhalgh in the chair, the report and accounts presented showed the following general results:—

Profits on gas account . . . . .	£1551 8 5
gas-fittings account . . . . .	113 14 6
" hired gas-fittings account . . . . .	31 14 4
" house-rents . . . . .	43 1 5
" premiums on C shares . . . . .	26 4 0
" interest on calls . . . . .	0 7 4
" bank interest, less commission, &c. . . . .	20 17 2
	£1787 10 2
Balance in favour of this account for half year ended	
Sept. 30, 1877 . . . . .	2937 9 11

Total profit . . . . . £7725 0 1  
The sum required for payment of dividend was £4199 10s. 8d., leaving a balance of £3235 9s. 5d. to be carried forward, and the Directors recommended that £1500 be added to the contingent account, and the remaining balance of £1725 9s. 5d. be carried forward to the next half year's account. The Directors expressed an opinion that the financial position of the Company justified a reduction in the price of gas, and proposed that a substantial reduction be forthwith made, to take effect from the commencement of the current quarter. The quantity of gas made during the half year was 44,018,000 cubic feet, as against 48,837,000 cubic feet in the corresponding half year in 1877, showing a decrease of 9.86 per cent., and the gas sold during the same period was 40,373,000, as against 41,984,000 cubic feet for the corresponding half year of 1877, the decrease being equal to 3.75 per cent. These results were mainly attributable to the strike in the cotton trade, which closed most of the mills for nearly two months, and the number of empty houses in the district. The leakage for the half year only amounted to 8.26 per cent. There had been a slight decrease in tar and coke sales, and a very substantial increase in the sale of ammoniacal liquor, which was likely to be continuous. The report of the Directors referred at length to the extension of works and plant that had recently taken place, and to the proceedings upon the Company's Bill this year in Parliament. The report was unanimously adopted, and a resolution declaring the maximum dividend to be paid to the Shareholders was passed. The retiring Directors and Auditors were re-elected, and votes of thanks to the Chairman and Officers were unanimously accorded.



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## TO CORRESPONDENTS.

E. G., Dunedin.—*Yours of the 12th of March received, and forwarded, as requested, to Mr. Fox.*

J. G. H., Wigan.—*Received.*

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.—*The report of proceedings at the last meeting reached us too late for insertion in present number.*

## THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 14, 1878.

### Circular to Gas Companies.

THE annual report of the Directors of the Paris Gas Company is always an interesting document, and we could almost wish to see its form and style imitated and copied by some of our leading Gas Companies, and Corporations who possess gas undertakings. It is true that any one who will take the trouble to study the accounts of English Companies in the form published by direction of the Board of Trade, can easily trace the development of the undertakings, and the extensions, which show the growth of the population and the progress of industry within their limits. The merit of the Paris Company's plan is, that a lucid connecting commentary brings out all the points on which observations are required. To start with, we are in this report informed that the consumption of gas during the past year did not show the increase which had taken place in what we may call previous normal years. It would seem that the effects of the War and the Commune have not yet completely disappeared from Paris; for the Directors express an expectation, that when the people return to their usual habits, a great rush will be made for a supply of gas. In order to provide for this anticipated demand, the Company are erecting new works on an extensive scale at Clichy. It is probable that, if European peace be preserved, the Exhibition will do much to calm the minds of the French people; and when that revival of industry, which we all so much desire to see, happens, the Paris Gas Company will largely share the benefits derived. It is noteworthy that the day consumption of gas in Paris continues to increase at a tolerably even rate, showing that gas is more and more used for culinary and other industrial purposes. The use of gas engines continues to extend in Paris. Last year the Company sold forty-two such engines, and it is estimated that the total consumption of gas for the production of force in 1877 amounted to 31,664,000 cubic feet. It would be interesting to know to what extent such engines are employed in London, where gas is so much cheaper than in Paris. Another direction in which the use of gas is extending in Paris is for the illumination of flats, by the use of what are called *conduites montantes*, or pipes passing up the interior of a house, which the Company supply gratuitously. From these, service-pipes are carried into the apartments, also at the expense of the Company, who, further, we believe, let fittings on hire. The practice seems to be followed with great success in Paris, and we should be glad to see it introduced into some of our model lodging-

houses, which are tenanted, for the most part, by respectable artisans, who would appreciate the use of gas.

During the year 1877 the Company carbonized coal costing £681,708; and the receipts for gas amounted to no less than £1,928,232. The residuals and manufactured products, &c., brought, £1,835,929, making the total revenue of the Company £2,764,151. Coke, as everywhere else, has been a drug in Paris, and the Company seem to have large stocks accumulated. Other residuals have also diminished in value; but, notwithstanding this, the Company make a large profit on their manufactured products. With such results, the Directors are, of course, able to pay the usual dividend, and carry forward a small balance.

The experiment with the electric light made yesterday week in front of the Mansion House and Royal Exchange can hardly be taken as a fair sample of the illumination which may be produced with this light. Two lamps were used, facing each other, one on the balcony of the Mansion House and the other placed in the *façade* of the Royal Exchange. The peculiarity of the invention which was exhibited lies in the construction of the lamp, in which the carbon points are placed in front of a semi-hexagonal reflector. The face of the lamp consists of a flattened convex opal glass, which hides the dazzling points of the carbon, and distributes the light in an equable manner. The effect, we are bound to say, was, so far, very good, and it may be that this form of lantern will prove serviceable in other combinations. The light of each lamp, yesterday week, was produced by the use of forty Bunsen cells, and, when modified by the opal glass, exhibited no particular intensity. Of course, we have to read that every gas-flame was paled before the dazzling luminosity, but we observed nothing of the sort. Every gas-jet looked as bright as ever. We studied their appearance in every possible way, and dare to affirm that nothing like what some of our contemporaries report took place, and that without gas the space between the two lights would have been very insufficiently illuminated; indeed, if lamps such as these were used to light up the space, at least five would be required. Five lamps, alimeted each by forty Bunsen cells, could not be economical, and gas has nothing to fear from this last invention of the enemy. It is said that six of them would be sufficient to illuminate the whole length of London Bridge, and we shall not dispute the opinion; all we want to know is how the lamps are to be fed with electricity, and by what arrangement the carbon points are to be changed. The inventor of this lamp has not, so far as we know, discovered any means of subdividing an electric current, and to illuminate London Bridge by means of Bunsen's cells would be an impossible task. It is but fair to remark that the lights exhibited on last Monday week burned with fair steadiness. There was an occasional flickering, but little more. It must be added, however, that they were not kept burning sufficiently long for any alteration of the carbon points to be required. We may express a favourable opinion of the lamp exhibited, but with no fear that it will lessen the use of gas.

The Medical Officer of Chelsea still continues to complain of the low illuminating power of the London Company's gas. This, we now find, he ascribes to what he terms an excess of carbonic acid. If that be the fact, the Company have an easy remedy; but we have before pointed out that Dr. Barclay tests the gas with one burner and the Company test with another. By this latter (Sugg's New "London" Argand, No. 1) the gas is represented as of over fifteen-candle power, while the Sugg-Letheby used by Dr. Barclay makes it only as between twelve and thirteen candles. This, however, constitutes no grievance against the Company, who are only bound to supply twelve-candle gas. According to the showing of their own Medical Officer, the Chelsea Vestry have nothing to complain of.

The Sheffield Gas Company have resolved to issue new share capital, in order to pay off their remaining mortgage debt of £99,400. The new shares will be of the nominal value of £8 10s. each, and the dividend upon them will be subject to the sliding scale. So prosperous are the Company, however, that ten per cent. will, no doubt, be paid at once. Although some classes of the shares of the Company are subject to the sliding scale, happily there are no auction clauses in the special Act; consequently the Directors are able to allot the shares among existing holders. A comparison was made at the meeting, by one of the Shareholders, of the prices charged by Corporations and Companies for gas, in the course of which the Sheffield Company appeared to great advantage. There is now, we think, no fear that the Corporation of Sheffield will endeavour to obtain possession of the gas undertaking. The consumers are perfectly satisfied with the Company, and, while gas is supplied at a reasonable rate, will continue to be so.

It can hardly be said that the consumers of Birmingham are perfectly satisfied with the Corporation. Some of them inquire



why gas should be dearer in Birmingham than in neighbouring towns, which enjoy no greater facilities for getting coal or distributing gas. There seems to be much discontent amongst the smaller consumers, who have to pay the highest price. The differential rates of charge, according to consumption, appear to be fair in principle, but they sometimes press heavily on those least able to pay the highest charge, and, no doubt, to some extent, prevent the more general use of gas. We would recommend the Gas Committee of the Corporation of Birmingham to reconsider the matter, and see if some relief cannot be given to the poor and small consumers.

The Corporation of Swansea have been measuring the quantity of gas consumed in some of their public lights. They have found, as a matter of course, that it is sometimes below and sometimes in excess of the quantity contracted for. The average amount consumed, however, in the lamps experimented upon was found to be somewhat in excess of that stipulated. We believe the Company's Manager, in his experiments, found the gas actually consumed per hour considerably above that given by the Corporation's Examiner. If we did not know that nothing the Gas Company could do would satisfy a section of the Corporation of Swansea, we should recommend them to adopt the average meter system at once. To this course, however, they are strongly adverse, and probably because they know it would remove all grounds of complaint against the Company. Alderman Jenkins would soon die of vexation if he had no opportunity of abusing the Gas Company; and for the same reason the *Cambrian* would, at times, find itself short of matter to fill its columns.

We have referred once or twice to a new process which is to produce gas for nothing, and by its sale give a profit of 150 per cent. We have before us a description of the invention given by, we presume, an admiring disciple, who is free to write, now that the inventor has secured patents for all quarters of the globe. Briefly speaking, the invention is this (we should say as described by a contemporary):—A boiler is placed above a retort, both being above a furnace, and flues being carried from the furnace around each. The boiler is to be filled with sewage or water. At the back of the retort are placed discs of iron, perforated in all directions, and, beyond this, closely packed limestone. Now comes the difficulty, for the inventor at starting makes no provision for fuel. We will suppose, however, that a coke fire is lighted in the furnace, that the retort is heated to redness, and that the sewage begins to boil. The steam from this passes to the back of the retort, and through the perforated iron plates, by which means the steam is decomposed, the oxygen uniting with the iron, and the hydrogen passing on. "Hydrogen," says the inventor, "burns with a pale blue flame, but immediately after leaving the iron discs, it comes in contact with the limestone, where it takes up carbonic acid," and so says the writer we quote from, "becomes lightly carburetted." So far the gas has acquired but little luminiferous power, for after passing through the limestone the mixed gases burn with a pale red flame. But now comes the part that sewage is to play in the business. It having been boiled to dryness, the solid residue is taken from the boiler and placed in the front of the retort, where, we are told, a large quantity of carbon is disengaged, which, combining with the "lightly carburetted hydrogen," forms a mixture which, when burned, gives off a great amount of light. We do not wish to do the inventor the slightest injustice, and therefore give this description as we find it. There are grosser absurdities in the description we quote from, but we shall not refer to them, unless we find them in the patentee's specification, which will shortly be published.

We are requested to make a statement, which, on our own parts, we should not have considered it necessary to make, that Mr. F. J. Evans, one of the Directors of The Gaslight and Coke Company, who is associated with Mr. Sugg in an invention which we described last week, has no pecuniary interest whatever in the patent, so far as his own Company are concerned, and, indeed, that he is not likely to derive any profit from it at all. It, and the associated invention, will be offered to all Companies in consideration of a payment of a small royalty, merely intended to cover the expenses which have been incurred.

### Water and Sanitary Notes.

At the meeting of the Metropolitan Board of Works, last Friday, it was resolved to withdraw the two Water Bills. And, accordingly, last night Sir J. M. Hogg moved in the House of Commons that the Order of the Day for the second reading of the Purchase Bill be discharged, and announced his intention of withdrawing the Supply Bill. The report and resolution brought

up by the Committee of the Board gave rise to an interesting discussion, which will be found reported in another column. It must have been clear to every one, even to Sir J. M. Hogg, that from the very first the Bills had but little chance of becoming law; and when the Home Secretary announced that the Government would give the Board no assistance, all hope must have vanished. We have a strong opinion that there are but few members of the Board who really wished the Bills to pass this session. We would prefer to see the question well ventilated, and the public mind stirred on the matter; but, as one Member almost pathetically remarked, the general public are utterly indifferent. The Vestries and District Boards—even those who gave the strongest support to the Board—lent but lukewarm assistance, and then only so far as regarded the Purchase Bill. The supply scheme was never supported by any section of the community, except a few *doctrinaire* sanitarians and engineers.

The Bills being withdrawn, there is, we fancy, an end of them for ever. The Metropolitan Board are not likely again to try to purchase the Gas and Water Companies. These Companies will be left in possession of their property for a long time to come; but they may be incessantly harassed by the promotion of measures designed to limit their powers and curtail their privileges. Against such there is no protection. The recklessness of the Metropolitan Board in squandering the ratepayers' money in parliamentary proceedings and engineering adventures, has become proverbial. It was stated at the last meeting that the cost already incurred this year on account of the Water Bills will amount to at least £12,000. If the Purchase Bill had gone before a Select Committee, as much more would probably have been spent, and all for nothing. It may be taken as certain that no Committee would have passed the preamble of the Bill; but after a month's inquiry, carried on at perhaps a cost of £1000 a day, the opposing parties would have been left in exactly the same positions. It was extraordinary to hear some Members of the Board argue, that, inasmuch as so large a sum of money had been already spent, it would be well to keep the Bills on the paper of the House of Commons, with a chance that Government and the friends of the Water Companies might one evening be caught napping, and the second reading of the Purchase Bill be carried by a sort of fluke. It would have been an unfortunate circumstance if such a thing had occurred, and the Members did well to reject the mischievous advice offered to them. It could only have led to greater expense, and of this we have had more than enough. A time, we are satisfied, will come when that much-enduring individual, the Metropolitan Ratepayer, will discover how his money is wasted. There is our friend, Mr. Leslie, endeavouring to show that the Board borrow two millions and a half of money at, say, three and a half per cent., and then deposit it at two or two and a half per cent.; thus losing at least one per cent., which must be drawn from the ratepayers' pockets. This is an odd sort of financing; but they do strange things at Spring Gardens. The officials took a cheque a short time ago for £90 7s. 6d.—in payment of some fees for testing gas-meters, we believe—but it was not cleared immediately, and in a few days the bank on which the cheque was drawn failed. We shall not pretend to decide on whom the loss will fall, whether on the meter maker or the ratepayers. It is a very small matter, and we do not suppose the Board will be much exercised over it.

The Thirlmere Defence Association have published a report, narrating the progress of the Manchester Corporation Water Bill through the House of Commons, and repeating their statements that Manchester could have got water much nearer home than Thirlmere. They indulge again, too, in the silly nonsense about spoiling the beauties of lake scenery by putting a lake to a useful purpose. Then comes, perhaps, the point; they want money to carry on their opposition in the House of Lords, and ask for £2000 for the purpose.

A deputation from the Gas and Water Committee of the Corporation of London went to Manchester and Liverpool last week, to inquire into the constitution of the Fire Brigades in these cities, and to see the use of hydrants. We rather think they arrived in Manchester a day too late; for on Monday morning there was a large fire in that city, and, as usual, when a fire gets full hold of premises, they are burned to the ground, brigade men and hydrants notwithstanding. In this case it is alleged that there was a great deficiency of water, and consequent want of pressure; but it must be known that the property destroyed was situated in a very low neighbourhood, and only supplied with water for potable and other domestic purposes. It seems, then, that the Corporation of Manchester are not altogether so successful in the management of their water undertaking as some would have us believe. Nothing worse could be said of a Metropolitan Water Company than that there was a deficiency of water in the case of a fire, even in a Whitechapel slum.



# A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLXV.

PUBLIC LIGHTING (continued).

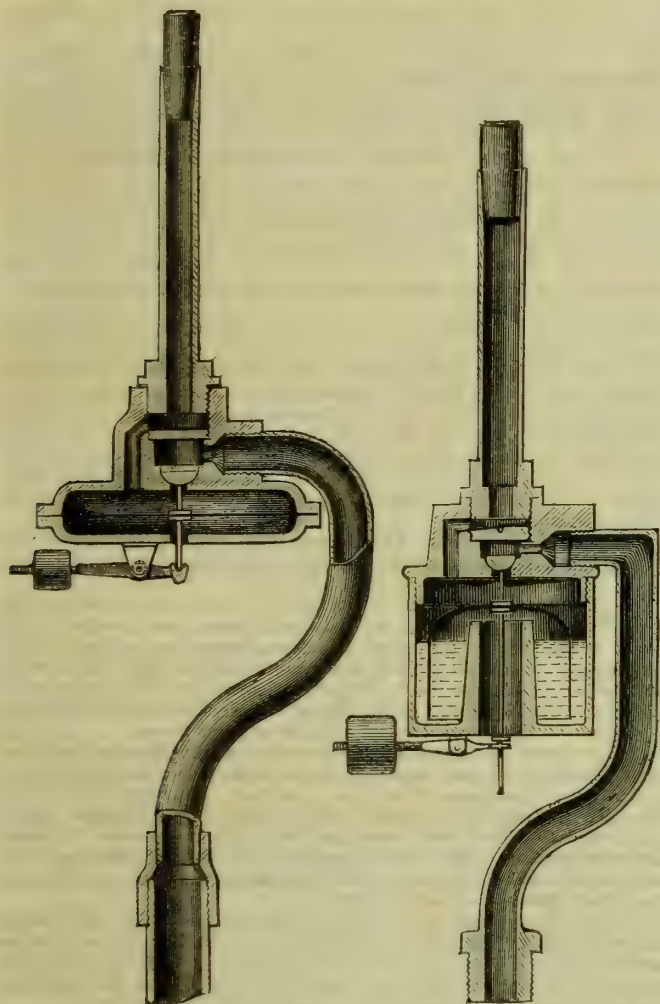


FIG. 48.

FIG. 49.

In the last chapter we described Mr. Foulis's automatic lamp-lighter; and we now give illustrations (figs. 48 and 49) of the same arrangement applied as a dry or wet governor, without the self-lighting apparatus. In this instance the air-pipe is dispensed with, and, instead, the bell is counterbalanced by a weight, by screwing which out or in, the pressure at the burner is altered as required. Both of these descriptions of governors are in successful operation.

The automatic lighting apparatus of Messrs. Flürscheim and Baumeister has been recently so well described in these columns, by Mr. A. F. Wilson, that nothing beyond calling attention to the paper\* exemplifying its action and utility need be said with reference to it here.

Ignition by the agency of electricity has been tried in different ways with varying success. One method of application is the arrangement above the burner of metallic points, approaching, but not coming in contact with each other, ignition being effected by means of the electric spark generated from an "intensity" battery. Another is that of sending a current of "quantity" electricity through an insulated copper wire leading to the burner from both poles of a voltaic battery, the ends of the copper wire being joined by a short piece of fine platinum wire, fixed permanently over the top of the burner. On the current being sent through the conductor, the platinum wire is heated sufficiently to ignite the gas issuing from the jet. The stopcock is opened and closed by an electro-magnet fixed near to it, and connected to the battery used for lighting.

The difficulties of maintaining an unbroken circuit through a long length of wire have hitherto proved insurmountable, principally from the liability of the heated wire to fuse, from the varying power in the discharge from the battery. To this is superadded the heat of the gas flame acting upon the permanently fixed wire across it, or from slight irregularities in the thickness of the wire itself.

An exception must, however, be made in favour of the invention of Mr. Lane Fox, described in the present volume;† the arrangement is as simple as it is ingenious and beautiful, and the tests to which it has been subjected augur well for its ultimate success.

In concluding the subject of automatic lighting, it will be appropriate here to quote a description of the method adopted for igniting, by means of the induction spark, the jets in the Royal Albert Hall, which is the largest building to which electricity has been applied in gas lighting. The arrangement employed was designed and carried out by Mr. Ladd, and in a paper read by Mr. W. Lloyd Wise before the Society of Arts, on March 5, 1873, the details of the system are thus explained:—

"The lights are arranged in 30 clusters of five stars each, each star containing 21 jets or burners. A bichromate battery is made to work an inductorium or induction coil, connected to which is a semicircular insulated arrangement. Attached to this are 30 wires, which lead off one to each of the 30 clusters.

"The burners are arranged in sets of three, somewhat like a three-pronged fork, and the ends of a couple of platinum wires, connected with the battery, are fixed within a short distance of each other, near the orifice of the centre burner of one set in each star, there being a special conducting wire from the battery to one of the stars in each cluster, or 30 wires in all. When the galvanic circuit is closed, by lowering the plates of the battery into the acid, a spark is caused to pass from the point of one platinum wire to the other, and thereby ignite the gas issuing from the burner. Since that burner is within lighting range of its neighbours at each side, they, in turn, with those next to them, and so on, the ignition of the gas proceeds from one to the other all round the star. The platinum wires are held by iron wires, attached by a small block of steatite to the stem of the burner, and are placed slightly below the horizontal line of the burner orifice, so that when the gas is alight, the upward draught draws the flame away, and so prevents deposit of carbon upon them. The gas is turned on and off by stopcocks in the mains in the ordinary way."

The conditions of lighting a building, such as that referred to, are, of course, widely different to those which obtain in the street-lamps. The supply of gas to the burners in the former case is controlled by one or two stopcocks, which are operated by hand, so that the system described is inapplicable to lighting the street-lamps, the automatic opening and closing of the gas passage in which is one of the principal difficulties to be surmounted.

It would be impossible, in the limited space at our disposal, to describe all the various contrivances for automatic lighting that have been patented from time to time. We have endeavoured to select those that are typical of the different plans that have been tried. They are, as a rule, remarkable for their ingenuity, but most of them have failed in practically meeting the every-day requirements of the work proposed to be accomplished by them. The problem, simple as it appears at first sight, is, without doubt, a difficult one to solve, and will further tax the ingenuity of inventors. Any plan, to succeed, must combine the essentials of simplicity with certainty of action, and for universal application it must be readily adaptable to meet varying circumstances.

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### GAS-WORKS CLAUSES ACT AMENDMENT ACT, 1871.

SIR,—The decision of the Court of Queen's Bench, in the case of the *Commercial Gas Company v. Scott*, respecting the Gas-Works Clauses Act Amendment Act, 1871, which was to the effect that the Act of 1871 applied to all Companies subject to the Act of 1847, irrespective of its being incorporated in any of their special Acts, has from time to time caused much trouble to Provincial Companies, and I have frequently been asked whether the Companies are subject to that Act without its being incorporated, as in all other similar cases in their special Acts or not.

The practice of Parliament in these cases may be simply described as follows:—

When application is made for a special Act, the Act is granted on the condition that the last general public regulations relating to the subject are made part of the special Act, and if at any future time an application is made for further powers, and other regulations have been made in the meantime, then that those other regulations are made part of the further Act; but, unless such further Act is applied for, the original regulations are never interfered with.

When Parliament has granted certain powers by means of a special Act for a given purpose, it has always declined to revoke or interfere with those powers, except at the instance of the parties to whom they were granted.

It has often been said that the Metropolis Gas Act, 1860, is an instance against this view, but it is not so. On the contrary, it is a very striking instance in support of it, which I will explain further on.

Within my knowledge there is no precedent for, and nothing to uphold, the decision in this case. The utmost that can be said in support of it is that the Act may be construed to apply in all cases of special Acts passed subsequent to 1871 without being incorporated, as all persons applying for special Acts subsequent to that date must have been aware of what the requirements were; but there is nothing to support the doctrine that it applies in other respects. I have, therefore, always said, in reply to these applications, that I have a very decided opinion that the decision in this case is founded on an entire misapprehension of the facts, and that, if the question were tried again on some other point this judgment would most surely be reversed; that I should disregard it, and go on in my old way, leaving it for those who felt themselves aggrieved to take action upon it to set themselves right.

There is, however, at the present time, a Bill pending in the House of Lords to consolidate, with amendments, the Acts of 1847 and 1871, and, as the insertion of a few words in that Act might remove all doubt upon the subject for the future, I have, with a view to further proceedings in that direction, recently gone into the case more fully than I have ever done before, and I am now more than ever convinced that the decision of the Court of Queen's Bench was, as I said before, founded on an entire misapprehension of the facts.

As the matter is important, and the Companies may have to take some action in it themselves very shortly, I trust you will allow me to state in your columns how the case presents itself to me.

The case may be thus shortly described: The Commercial Gas Company, one of the Companies supplying the Metropolis, and subject to

\* See Vol. XXX., p. 18.

† See ante, p. 18.



the Gas-Works Clauses Act, 1847, as amended by the Metropolis Gas Act, 1860, but not subject to the Act of 1871, as they contended, that Act not being incorporated in any of their special Acts, for some reason or other cut off the supply from one of their consumers, and refused to reconnect it.

The consumer thereupon summoned the Company before a London Magistrate under the Act of 1871. The Company contended that they were not subject to that Act, but the Magistrate held a different opinion, and convicted them in a penalty of £10—the Act prescribing a penalty of £2 per day. The Company thereupon appealed to the Court of Queen's Bench against the conviction, but the Court held that the conviction was right.

The case is reported in the Queen's Bench Reports, Vol. X., p. 100, but the report is not a very lucid one; nevertheless, as it is the recognized official report, we must deal with it as correct. But, to make it intelligible to non-professional readers, it will be necessary to quote it at some length.

The following is an epitome of the report and decision:—

"LUSH, J.—Sect. 1 of the Act of 1871 says the Gas-Works Clauses Act, 1847, and this Act shall be construed as one Act, and the provisions of this Act are to supersede such of the provisions of the Act of 1847 as are inconsistent with them. Surely, by that the Act of 1847 stands amended, not only in the statute-book, but in every private Act in which it has been incorporated.

"QUAIN, J.—Sect. 1 of the Act of 1871 amends the Act of 1847, as incorporated with other Acts, and Sect. 3 makes the two Acts apply to all future Companies, without any incorporation being necessary.—Sect. 3 being as follows: 'The provisions of this Act shall apply to any gas undertaking authorized by any special Act hereafter passed, or by any Provisional Order made under the authority of the Gas and Water Facilities Act, 1870, save when the said provisions are expressly varied or excepted by any such special Act or Provisional Order.'

"LUSH, J.—I am of opinion that this conviction is right. The Act of 1847 was a model Act, which was to be applied to all Companies and all gas-works authorized by any Act of Parliament which shall declare that the Act shall be incorporated therewith. Then came the Act of 1852 to establish this Company, which had a clause incorporating the Act of 1847. Then, in 1860, there came the general Act 23 & 24 Vict., cap. 125—an Act for better regulating the supply of gas to the Metropolis, called the Metropolis Gas Act, and that Act recited all the London Companies, of which the Commercial Company is one. And Sect. 2 of that Act says: 'The Gas-Works Clauses Act, 1847 (except so far as the provisions thereof are inconsistent with this Act), is incorporated with and forms part of this Act, and shall apply to the several Companies before named or referred to as fully as if the gas-works of the several Companies were authorized by this Act.' Therefore from that time the Act of 1847, as amended by the Act of 1860, was directly applied to all the Gas Companies of the Metropolis, and consequently the operation of the Act of 1847 upon those Companies did not depend upon the incorporating clause of the private Act, but upon the general enactment in Sect. 2 of the Act of 1860, which had the same effect as if there had been no [probably intended for 'an'] incorporating clause in the private Act. Then came the Act of 1871 (34 & 35 Vict., cap. 41), which is another model Act, not an Act solely for the particular Companies like the Act of 1860, but a model Act for application to any Gas Company incorporated under an Act of Parliament. Sect. 1 of this Act says: 'The Gas-Works Clauses Act, 1847, and this Act, shall be construed together as one Act, and the provisions of this Act shall be held to repeal and supersede such of the provisions of that Act as are inconsistent with this Act.' That of necessity, therefore, takes in the Act of 1860, because that took in the Act of 1847, and said the Act of 1847 and the Act of 1860 should be read as one Act. I cannot, therefore, entertain the slightest doubt that every provision in the Act of 1871 governs all the London Gas Companies. Indeed, it would be an extraordinary thing if it were not so, because that Act was passed to secure a great benefit to the public and advantages to Gas Companies; and, amongst others, it appointed Public Examiners, by whom the illuminating power of gas should be tested from time to time, and other regulations. It would be an alarming thing to the inhabitants of the Metropolis to find that not one of those provisions—for that would be the consequence if Mr. Williams's argument were to hold good—would be applicable to any part of the Metropolis."

It is evident from this that the Court gave its judgment under the impression that, by imposing the Act of 1871 upon the Metropolitan Companies, instead of the Act of 1860, it was protecting the interests of the Metropolis.

The Court said the Act of 1871 contains provisions for the appointment of Examiners for testing the illuminating power of the gas, and other regulations, and it would be an alarming thing to the inhabitants of the Metropolis if they were to find themselves deprived of these advantages.

Whereas the fact is that the Act of 1860 had conferred all these advantages, and many more equally beneficial, upon the Metropolis, many years before, and the Act of 1871 was merely a modification of the Act of 1860, designed to confer some of the advantages of that Act—but not all—upon other places.

The Court, therefore, in throwing the Act of 1860 overboard, and putting that of 1871 in its place, was taking away from the Metropolis that which was in the highest degree beneficial to it, and giving it something else in return that was comparatively of no value at all.

The judgment, therefore, instead of being a protection to the inhabitants of the Metropolis, as the judges intended and expected it would be, was precisely the reverse.

The judge quotes clause 1 of the Act of 1871, which enacts that the provisions of that Act shall supersede those of 1847, and then says that as the Metropolis Gas Act, 1860, had previously, to some extent, superseded the Act of 1847, so also the Act of 1871 had superseded the Act of 1860; but besides the Act of 1860, there was another Act passed in 1868, called the City of London Gas Act, which repealed, as respects the City, certain parts of the Act of 1860, and made other provisions in lieu thereof. This Act was not referred to in the case, as the matter did not affect the City; but if the decision is good as respects the Act of 1860, it is also good as respects the Act of 1868, and both Acts are repealed; but, as a matter of fact, the judgment is a mistake, and the Acts are not interfered with.

The Act of 1847 is a consolidation Act, and the Act of 1871 is the same; consequently, in all cases where the Acts apply, the last, as a matter of course and without any express provision to that effect, either repeals or amends the first. Of that there is no doubt; but both Acts say that the provisions thereof shall apply, not absolutely, as the

judgment declares, but "save where the provisions shall be expressly varied or excepted by the special Acts."

The judgment, in saying that the Act of 1871 superseded the Act of 1860, assumes that the Act of 1860 is a consolidation Act, but it is not so; on the contrary, it is a special Act, and says: "Clause 3. This Act applies to the several Gas Companies, and to all persons already or hereafter supplying gas within the Metropolis;" and, consequently, the Act of 1871, even if the Companies were subject to it, would not repeal or interfere with the Act of 1860.

When the Metropolis Gas Act of 1860 was first proposed, there were 13 Companies in the Metropolis. If, therefore, the regulations of that Act—which the Companies had agreed to before the introduction of the Bill—had been imposed upon each Company separately, there would have been 13 separate Acts, which would have caused both delay and expense; and so, to avoid this, it was agreed to substitute one Act applicable to all the Companies, and proceed with it as a public Act, under the title of "The Metropolis Gas Act;" but it is none the less a special Act for the Metropolis, to all intents and purposes. Its very title implies that it is so, just the same as the Manchester Gas Act, or the Birmingham Gas Act, or that of any other large town. The City of London Gas Act was passed under precisely the same circumstances, only in a lesser degree.

Under the Act of 1860, the Metropolitan Companies are required to furnish a supply of gas, and lay down, at their own expense, all services within 150 feet; but under the Act of 1871, Companies are required to supply gas, and lay down 30 feet of service only. The Court, in giving its decision, noticed this; but said that, as the Act provided no remedy in case the Companies did not do it, they could only be sued, it was, no doubt, intended to be so; but this is another misapprehension, as the penalty and mode of recovery are precisely the same in both Acts—viz.: "A sum not exceeding forty shillings for every day" during which the supply is withheld.

If this had been my case, I would, immediately after the decision had been given, have got up another case, reversed the positions, and tried the question over again upon some other issue.

I would have assumed that the judgment was correct; that the Act of 1860 had been repealed; and that the Company were subject to the Act of 1871; and, then, in some case where there was a long service, have made a charge for all the distance beyond 30 feet. This would have led to a summons from a Magistrate, when I would have pleaded the former decision; and if this point was decided against me, have gone again to the Queen's Bench with the same defence.

I have shown the effect of the decision on the Metropolitan Companies, because the case occurred in the Metropolis; but it is only for the Provincial Companies that I am concerned. The report leads to the inference that the Court held, that, as public Acts came into operation immediately they were passed, and repealed, or amended, all former Acts relating to the same matter, and the Acts of 1847, 1860, and 1871 were public Acts, so the Act of 1847 was amended by that of 1860, and the Act of 1860 by the Act of 1871.

It is this kind of reasoning, no doubt, that has led to this very unsatisfactory judgment, for nothing could be more delusive. Public Acts are not all alike, and cannot be dealt with on the same footing. Many Acts are passed as public Acts which relate solely to private undertakings, and which are in their character unquestionably special Acts.

Under the title of public Acts there are—

1. Acts relating to the general public law, in which we are all interested alike.
2. Acts to confirm Provisional Orders granted by the Board of Trade, and the Local Government Board, for the construction of gas-works water-works, piers, harbours, tramways, &c.
3. Acts (consolidation) to regulate the constitution of companies, the purchasing of lands, the management of Railway Companies, Gas Companies, Water Companies, &c.
4. Acts relating to special subjects, providing for certain things and in certain events.

All these are public Acts, but they do not all operate, and cannot all be dealt with, in the same way; it is only the first class—those which affect the public interests generally—that can, strictly speaking, be called public Acts. With these it is, no doubt, the fact that each in its turn supersedes or amends the preceding Acts relating to the same subject.

But this rule does not apply to the other Acts, in which the public, as a body, are not interested. The Consolidation Acts, in particular, stand on an entirely different footing; they are not, it may be said, laws in themselves, but merely advertisements—notice to the public that, if they require from Parliament any special powers, they must comply with the regulations prescribed in those Acts, as no such powers can be granted without them. When they are incorporated in special Acts, they become law, but not otherwise, and even then only as and because they form part of the special Act. It never was, and it is quite impossible to suppose that it ever could have been, the intention of Parliament, in passing those Acts, to impose them bodily upon all parties to whom they relate, immediately they were passed, whether the parties were willing to adopt them or not. On the contrary, the intention of Parliament was simply to forewarn the public that in seeking for any special powers, they must be prepared to adopt the general regulations applicable thereto, as embodied in these Acts.

The provisions of the Acts themselves are not inconsistent, but, on the contrary, confirm this view. All the original Acts say that they shall apply only when incorporated with any special Act thereafter passed. Some of the amending Acts omit the words, "incorporated with," but this does not impair the provision. The objects and purport of the Acts are governed by the originals, the amending Acts are merely matters of detail.

The authorities of the two Houses of Parliament always require the amending Acts to be incorporated in every special Act passed subsequently, whether there is a provision in the Act to that effect or not. We may, therefore, infer that they do not suppose that they apply without incorporation; and the Board of Trade in all their Provisional Orders do the same.

The Board of Trade were the promoters of the Act of 1871, and in all their Provisional Orders passed subsequently, except such as relate to



capital only, the Act is incorporated; it may, therefore, be safely inferred that it was not their intention that the Act should, nor their belief that the Act does, apply without incorporation.

The Court, in order to bring the Companies under the Act of 1871, seem to have relied chiefly on Clauses 1 and 3, which are as follows, viz. :—

"Clause 1.—The Gas-Works Clauses Act, 1847, and this Act shall be construed together as one Act, and the provision of this Act shall be held to repeal and supersede such of the provisions of that Act as are inconsistent with this Act.

"Clause 3.—The provisions of this Act shall apply to any gas undertaking authorized by any special Act hereafter passed, or by any Provisional Order made under the authority of the Gas and Water Works Facilities Act, 1870, *save where the said provisions are expressly varied or excepted by any such special Act or Provisional Order.*"

Clause 1 of the Act of 1871 says the Acts of 1847 and 1871 are to be read as one Act, and that the provisions of 1871 are to repeal such of the provisions of 1847 as are inconsistent therewith. Consequently, such of the provisions of 1847 as are not inconsistent with 1871 remain, and are operative still.

Clause 1 of the Act of 1847 says: "This Act shall extend *only* to such gas-works as shall be incorporated by any Act of Parliament *hereafter* to be passed which shall declare that this Act shall be incorporated therewith."

There is nothing in this last provision which can in the slightest degree be construed to be inconsistent with the Act of 1871; consequently, it governs the whole matter. As it stood in the original Act, so it stands in the amended Act—that is to say, as the original Act was *only* to apply when incorporated, so the amended Act is *only* to apply in the same way.

The Acts of 1847 and 1871 are in future to be read together as one amended Act. The Act of 1847, as originally drawn, is, therefore, to remain in force, wherever it is incorporated, until in some other Act, *hereafter* to be passed, the amended Act shall be incorporated, and thenceforth—and *only* thenceforth—the Act, as amended, is to be in force.

The Act of 1871, even taken by itself, is not inconsistent with this view; but, on the contrary, confirms it.

Clause 1 says the two Acts shall henceforth be read together as one Act; and clause 3 says this Act—that is, the Act as amended—shall apply to every gas undertaking authorized by any special Act or Provisional Order hereafter passed.

Notwithstanding all this, the two Justices who heard this appeal, each speaking for himself, decided as follows :—

"LUSH.—That the Act applied at once, immediately it was passed, and, consequently, before it was possible to incorporate it, to all Companies subject to the Act of 1847.

"QUAIN.—That the two Acts applied to all future Companies, without any incorporation being necessary."

To understand the effect of the last observation, it must be borne in mind that the two Acts are to be construed together as one Act. It will not be possible to incorporate 1871 without 1847, or 1847 without 1871; consequently, the Act of 1847, as amended by the Act of 1871, is to apply to all future Companies, without any incorporation being necessary. Can any one say what the meaning of this is?

It is difficult, at best, to get any precise meaning of the words, "that the Act shall apply to all future Companies;" but when the Court itself has decided that the Act, without any special provision to that effect, applies to a Company incorporated 25 years ago, it seems useless to attempt it.

Since this judgment was given, counsel's opinion as to whether the Act does apply or not has been taken on two or three different occasions, and on each occasion the opinion given (so far as I have heard it) has been in favour of the views of the Court; but when a case has been decided, appealed against, and confirmed, it can hardly be expected that counsel will give an opinion against the Court, as they must, to some extent, be governed by the Courts.

I have carefully considered this matter in all its bearings, so far as they have occurred to me, and I have endeavoured to do so impartially; but I still entertain, as I stated before, a very decided opinion that the decision was given under a misapprehension of the facts on all points, and that it is, consequently, wrong in every possible way.

Referring again to the Metropolis Gas Act, the explanation I promised to give respecting it is this: A few years before that Act was passed the London Companies had been fiercely competing with each other in all the chief parts of the Metropolis—two and sometimes three Companies in the same street. This had been carried to a state of complete exhaustion by some of the Companies, and almost so by others, when they agreed among themselves to take separate districts, and not interfere with each other, and thereupon they made an exchange of customers, which caused great dissatisfaction, and led to a parliamentary inquiry.

One session was occupied in this inquiry—the Companies contending, on the one hand, that they were not obliged to supply gas to any one, that they could do so or not as they thought fit, and that what they had done was quite within their powers; their opponents contending, on the other hand, that although the Companies were not bound to give a supply, still, having given one, and entered into contracts with their consumers to do so, they had no right to break through those contracts, refuse to continue the supply, and transfer the consumers to other Companies.

This was a novel doctrine at the time, although it would be accepted as a matter of course now. The Companies, however, seeing the difficulty that they would be placed in if this point was driven home and given against them, entered into negotiations with their opponents, and this resulted in an arrangement by which all the Companies agreed to submit to certain general regulations, upon the condition that their districting arrangements were sanctioned.

A Bill was thereupon prepared embodying these regulations, with some others which both parties agreed should be left for the decision of Parliament.

The Companies, therefore, were themselves the promoters of the Bill with some of the London parishes.

The Bill was referred to a Select Committee to settle the disputed

points; these were decided, some in favour of, and some against, the Companies—the Companies accepting the decisions, and continuing their position as promoters until the question of dividend came up, when the Committee proposed to reduce the maximum from 10 to 8 per cent. This the Companies declined to accept, and withdrew. The Committee then finished their labours in the absence of the Companies, and reported the Bill to the House.

The Companies appealed to the House against this arbitrary interference with their parliamentary powers without their consent, and the House sent the Bill back to the Committee.

The Companies then appeared before the Committee a second time, when the 8 per cent. was struck out of the Bill and 10 per cent. reinstated, and then the Companies carried it on to the conclusion.

When the Bill reached the Lords some of the parishes that had been joint promoters in the Commons wished to oppose, but this the Lords would not allow.

The Companies were throughout the whole of the proceedings (except at the time when they withdrew) the joint promoters of the Bill, and without their consent it never would have passed.

This is not, therefore, a case of interference with prescriptive rights without consent, but rather a strong illustration of the other view.

W. LIVESSEY.

Gas and Water Companies Association, 5, Victoria Street,  
Westminster, May 11, 1878.

#### HOW NOT TO DO IT.

SIR,—I will answer the communications which have appeared in the JOURNAL on this question next week. Having occupied so much space on another subject, I am afraid to trespass further in the present number.

W. LIVESSEY.

#### WATER GAS.

SIR,—In the "Circular to Gas Companies," in your last issue, reference is made to a report by Professor Würtz, on the water gas made and supplied by the Municipal Gas Company, New York. Permit me to mention that the process used by the said Company is not "what is known in New York and other cities of the United States as the Lowe system of gas-making;" it is rather what should now be called the Kirkham-Rowland process—to my mind, a very superior method.

I am sure you will only be too glad to correct the statement when I inform you that what is now being done is simply the outcome of improvements made by Mr. T. F. Rowland, of the Continental Works, Brooklyn, on the process invented by Messrs. John and T. N. Kirkham, and secured by patents in 1852 and 1854. In short, it is the Kirkham process brought into practical use on a large scale by Mr. Rowland.

As I happen to know something of the history and practice of the affair, I will supply you with it, if you think it worth while.

May 8, 1878.

W. MANN.

[Our correspondent will find, on referring again to the "Circular" of last week, that although the system of water gas manufacture at the New York Municipal Works is referred to, it is not mentioned as the Lowe system. We shall be glad to hear from our Correspondent any particulars of the system alluded to in his letter.—ED. J. G. L.]

#### MESSRS. EVANS AND SUGG'S PATENT.

SIR,—In the last number of your JOURNAL, you noticed a patent, for dealing with the sulphur compounds, by Messrs. Evans and Sugg. If you will refer, Mr. Editor, to Hills's patent for heating gas liquor, you will find that the whole value of this invention has been anticipated by Hills. It is true that Hills does not make a pure caustic ammonia, but he makes it sufficiently pure for the purpose—that is, to remove the sulphur compounds other than sulphuretted hydrogen. Besides, Hills's patent will do it at much less cost than Messrs. Evans and Sugg's. In Hills's, the whole of the carbonic acid is allowed to escape into the air, thus saving the whole of the lime, while in Messrs. Evans and Sugg's, lime has to be used. It may be urged that Hills does not make the liquor sufficiently strong; but a patent has been taken out by Messrs. Collinge and Paterson, by which, with a slight alteration of Hills's apparatus, the concentration of the liquor could be effected to any strength desired. I may say, from experiments I made some time ago, that the "sulphur other than sulphuretted hydrogen" may be brought down to as low as 5 grains per 100 cubic feet of gas by an excess of free ammonia in the gas, which must afterwards be washed out.

CHEMICS.

#### THE TEMPERATURE OF GAS IN ASCENSION-PIPES.

SIR,—In the May number of the "Treatise," Part 4, Chap. I., in the article on "Condensation," a quotation is given from Clegg (4th edition, p. 174), to the effect that the gases and vapours generated in a retort heated to, say, 1800° Fahr., if allowed free egress, are found to have the temperature of only 120° to 130°.

I am afraid this matter has not received the attention it deserves; and, without for a moment reflecting upon the well-known talent and ability of my esteemed friend, the Editor of the "Treatise," I shall, with your kind permission, and in the interests of our profession and of science, give you the results of some experiments I made some time ago on the temperature of the gases evolved from a small experimental retort.

The retort was of cast iron, D-shaped, 5 inches wide on the bottom, and 5 inches high. In the first experiment a thermometer was inserted in the side of the ascension-pipe, about 3 inches above the mouthpiece, having the bulb across the axis of the pipe, which was 1½ inch in diameter. An ordinary working heat having been obtained, a charge of 2½ lbs. of coal was put in, and the retort evolved with a luted lid in the ordinary way. The temperature of the sealed gases was immediately observed; but before any reading could be made, the thermometer had to be quickly withdrawn to prevent accident, the temperature having risen from about 80°—at which the mercury stood before the retort was charged—to no less than 640°; and had the thermometer not been removed, it would, as I afterwards discovered, have been broken, as the temperature was higher than the boiling-point of mercury.

This was, to me, an unexpected and startling discovery, and one



which I am not aware has been anywhere commented upon, or even observed, either by laboratory experimenters or by practical gas-makers.

Finding that mercury could not be used to indicate the heat of the gases so near to the mouthpiece, and not having any other means at hand at the time suitable for the purpose, a thermometer was passed through a plug in the top of the ascension-pipe, keeping the bulb about 18 inches above the mouthpiece, instead of only 3 inches as before. A fresh charge of 2½ lbs. of coal was then put into the retort, and the temperature of the gases noted every minute.

In this and other experiments, some of which I give in a table appended, I again met with an unexpected result, and one which I do not think is generally accepted—namely, that the temperature of the gases evolved from any given weight of coal is highest when the quantity given off is greatest, or, in other words, the gases from the early part of the charge are hotter than those from the latter part; and also that the heavier the charge of coal the higher is the temperature of the gases during the most active period of production.

Temperature of Gas evolved from Coal at Different Periods of the Charge.

Time.		Quantity of Coal Carbonized.							
		4½ lbs.	2½ lbs.	2½ lbs.	2½ lbs.	2½ lbs.	1½ lbs.	1½ lbs.	¾ lb.
Min.	Degs.	Degs.	Degs.	Degs.	Degs.	Degs.	Degs.	Degs.	Degs.
1	363	—	416	350	420	420	—	382	—
2	482	—	490	496	520	494	—	476	—
3	506	550	506	514	532	494	440	466	—
4	512	529	501	508	530	474	506	436	—
5	518	516	495	506	512	444	494	402	—
6	526	510	483	502	492	414	466	362	—
7	524	502	468	492	488	390	430	332	—
8	524	495	458	482	460	374	408	312	—
9	524	490	440	462	450	362	382	296	—
10	524	508	412	462	442	350	362	270	—
11	544	490	390	445	—	338	346	250	—
12	520	484	376	438	436	328	334	228	—
13	528	476	366	436	—	317	326	210	—
14	526	460	362	434	422	306	319	200	—
15	536	460	360	434	—	290	308	192	—
16	532	450	356	436	412	278	294	185	—
17	526	422	355	426	—	260	282	178	—
18	520	418	352	417	—	242	267	173	—
19	518	406	350	422	—	228	250	171	—
20	506	406	348	418	382	212	234	168	—
21	498	396	344	408	—	200	218	165	—
22	476	400	334	388	—	188	208	162	—
23	460	376	322	372	—	182	198	160	—
24	456	372	312	360	—	175	191	157	—
25	414	362	300	349	370	170	186	155	—
26	398	348	300	338	—	164	—	—	—
27	404	332	284	330	—	160	—	—	—
28	396	308	280	322	—	—	177	—	—
29	382	288	278	304	—	—	—	—	—
30	386	270	272	284	—	—	—	—	—
31	385	254	264	270	206	—	—	—	—
32	380	238	252	258	—	—	—	—	—
33	378	230	242	247	—	—	166	—	—
34	373	214	232	234	—	—	—	—	—
35	372	202	218	222	—	—	—	—	—
36	360	194	198	212	—	—	—	—	—
37	352	186	186	196	—	—	—	—	—
38	338	180	174	186	—	—	—	—	—
39	324	172	170	180	—	—	—	—	—
40	316	168	165	174	172	—	—	—	—
41	312	—	162	170	—	—	—	—	—
42	302	—	160	167	—	—	—	—	—
43	284	—	158	164	—	—	—	—	—
44	272	—	155	162	—	—	—	—	—
45	260	—	153	160	160	—	—	—	—
46	248	—	—	—	—	—	—	—	—
47	238	—	—	—	—	—	—	—	—
48	232	—	—	—	—	—	—	—	—
49	220	—	—	—	—	—	—	—	—
50	214	—	—	—	—	—	—	—	—
51	206	—	—	—	—	—	—	—	—
52	200	—	—	—	—	—	—	—	—
53	196	—	—	—	—	—	—	—	—
54	192	—	—	—	—	—	—	—	—
55	188	—	—	—	—	—	—	—	—
56	184	—	—	—	—	—	—	—	—
57	182	—	—	—	—	—	—	—	—
58	180	—	—	—	—	—	—	—	—
59	176	—	—	—	—	—	—	—	—
60	172	—	—	—	—	—	—	—	—
Gas made . . .		Cub. Ft. 9.5	Cub. Ft. 9.0	Cub. Ft. 9.3	Cub. Ft. 10.3	Cub. Ft. 5.2	Cub. Ft. 6.1	Cub. Ft. 3.5	
Per ton . . .		9457	8960	9258	10,254	9318	10,931	10,427	
Illum. power, sperm cands.		—	17.91	—	16.78	18.48	—	—	

The tabulated results show some apparent anomalies, but they may reasonably be accounted for by irregularities in firing the furnace, and by atmospheric disturbances from opening and shutting doors. They do, however, I venture to think, open up a wide field for investigation and study, and I hope to have the privilege, on a future occasion, of giving the results of other experiments correlating temperatures, illuminating power, and yield of gas.

It may be necessary to mention, in order to show that high temperatures are not simply the result of laboratory work, that an attempt was made to take the temperatures at an ascension-pipe in the retort-house in the ordinary course of working; but the thermometer, which was placed about 3 feet above the mouthpiece, was destroyed at 645°. What the actual temperature on the occasion was I had no means of ascertaining, but that it was above that of boiling mercury there can be no doubt.

Gas-Works, Cheltenham, May 4, 1878.

R. O. PATERSON.

Parliamentary Intelligence.

HOUSE OF COMMONS.

MONDAY, MAY 6.

Hemel Hempstead District Gas Bill,—read the third time, and passed.  
East Retford Borough Bill, Stoke-upon-Trent Corporation Gas Bill,—as amended, considered; to be read the third time.  
Hamilton Burgh Bill,—as amended, considered; amendments made; to be read the third time.  
Castleford and Whitwood Gas Bill (Lords), Clitheroe Gas, Water, and Improvement Bill (Lords), Normanton Gas Bill (Lords),—read a second time, and committed.  
Trowbridge Water Bill (Lords),—read the first time, and referred to the Examiners.  
Metropolis Water-Works (Purchase) Bill,—adjourned debate on amendment on second reading, further adjourned to Friday, May 10.  
A petition against alterations in the Newry Gas Bill (Lords) was presented from Newry Gas Consumers Company, Limited.  
A petition against the Warrington Water Bill (Lords) was presented from the Corporation of Warrington.

TUESDAY, MAY 7.

The Examiners reported that no Standing Orders, not previously introduced into, are applicable in the case of the Warrington Water Bill (Lords).  
Local Government Provisional Orders (Droitwich, &c.) Bill,—to confirm certain Provisional Orders of the Local Government Board under the provisions of the Gas and Water Works Facilities Act, 1870, and the Public Health Act, 1875, relating to the Borough of Droitwich, the Local Government District of Ilkeston, the Borough of Saffron Walden, and the Local Government District of Tow Law—ordered to be brought in by Mr. Salt and Mr. Slater-Booth.  
The Drumcondra, Clonliffe, and Glasnevin Township Bill was referred to a Select Committee consisting of Mr. Portman (Chairman), Mr. Foljambe, Colonel Arbutnot, Mr. Elliott, and Mr. Bonham-Carter (Referee); to meet on Tuesday, May 14.  
The Grand Junction Water Bill was referred to a Select Committee consisting of Sir Joseph Bailey (Chairman), Mr. Ion Hamilton, Mr. Brocklehurst, Mr. Blake, and Sir John Duckworth (Referee); to meet on Thursday, May 16.

WEDNESDAY, MAY 8.

Marske and Saltburn Gas Bill,—Lords amendments agreed to.  
Maryport Improvement Bill,—read the third time, and passed.  
Local Government Provisional Orders (Droitwich, &c.) Bill,—read the first time, and referred to the Examiners.

THURSDAY, MAY 9.

The Examiners reported that the Standing Order, which is applicable to the Gas and Water Orders Confirmation Bill, has been complied with.  
East Retford Borough Bill, Hamilton Burgh Bill, Stoke-upon-Trent Corporation Gas Bill,—read the third time, and passed.  
Public Health Act (1875) Amendment (recommended) Bill,—considered in Committee of the whole House, and reported.  
The *locus standi* of the following petitioners against the Castleford and Whitwood Local Board Bill (Lords) has been disallowed:—(1) Surveyors of Highways and Overseers of the Poor of Allerton Bywater and others, (2) Overseers of the Poor and Owners and Ratepayers of Fryston, (3) Charles Wheler and others, except so far as affects Charles Wheler.

POLLUTION OF RIVERS.

Mr. TENNANT asked the President of the Local Government Board whether any, and, if so, what steps have been taken by Her Majesty's Government to put in force the provisions of the Rivers Pollution Prevention Act of 1876, and with what results.  
Mr. SLATER-BOOTH said: The duty of putting in force the provisions of the Rivers Pollution Prevention Act of 1876, as my honourable friend is aware, does not devolve upon the Government, but upon the Local Authorities. So soon as the Act came into complete operation, which was not until August, 1877, a circular was issued by the Local Government Board calling the attention of the Local Authorities to their powers and duties under the statute, and applications immediately began to come in from various quarters—firstly, for certificates; secondly, for extension of time; and thirdly, for consent to proceedings being taken. I may mention, to show that the operation of the Act has been widely spread, some of the places where proceedings have been taken—viz., Salisbury, Canterbury, Barnet, Wigan, Grantham, Isle of Wight, Withington, Hereford. But perhaps the most important result of the Act has been the prevention of fresh pollution of rivers, as no loan for sewerage works is now sanctioned unless provision is made for the purification of the sewage.

FRIDAY, MAY 10.

Manchester Corporation Water Bill,—as amended, considered; to be read the third time.  
Radcliffe and Pilkington Gas Bill,—reported.  
York United Gas Bill (Lords),—reported, without amendment.  
METROPOLIS WATER-WORKS (PURCHASE) BILL.  
Sir J. M'GAREL-HOGG gave notice that on Monday, May 13, he would ask leave to move to discharge the order for the second reading of the Metropolis Water-Works (Purchase) Bill.

SATURDAY, MAY 11.

A petition against the Metropolis Water Supply Bill (the petitioners not praying to be heard) was presented by Mr. John Holms, from the Hackney District Board of Works.

HOUSE OF COMMONS COMMITTEE.

MONDAY, MARCH 18.

(Before the Marquis of LORNE, Chairman; Mr. STANKEE, and Mr. ERNEST NOEL; Sir JOHN DUCKWORTH, Referee.)  
CHELTENHAM WATER BILL.  
CHELTENHAM CORPORATION WATER BILL.  
(Concluded from p. 715.)

Mr. Robert Etheridge, F.R.S., Vice-President of the Geological Society, said he was attached to the Geological Survey. He was acquainted with the springs and streams of the Dowdeswell Valley. It was peculiarly adapted for the supply of Cheltenham; the land was chiefly pasturage, and not highly cultivated. He knew the site of the proposed reservoirs. There was no source of contamination, and it was difficult to imagine a valley with better catchment and better adapted for the formation of reservoirs.

Mr. POPE said the previous Thursday the Committee asked Mr. Bateman about the offer made to the Company, but Mr. Bateman was unable to give any information. It was only right, however, that the Committee



should know what offer had been made. It was contained in a letter from the Town Clerk, on the 13th of March inst., and it was a better offer than that which had been before made on behalf of the Corporation. That offer the Corporation were quite prepared to abide by. The letter was as follows:—

3, Whitehall Place, London, S. W., March 13, 1878.

Dear Sir,—I am instructed by my Committee to make you an offer equivalent to 25 years purchase on your maximum statutory dividends in perpetual annuities; that is to say, the annuities equivalent to the interest paid on your preferred stock, and annuities equivalent to 10 per cent. on your ordinary share capital of £55,625; the Corporation taking over the mortgage debt, but free from all other charges and incumbrances.

This is the utmost we can give, and must be considered our ultimatum.

We shall expect to receive your reply by one o'clock to-day.

I think it right to add that we reserve to ourselves the right to give this offer in evidence.

E. L. Griffiths, Esq.

Yours truly,

E. T. BRYDGES.

He ought to tell the Committee that the previous offer of the Corporation was 25 years purchase upon the preference and guaranteed stock, and 22½ years upon their ordinary stock. This offer was 25 years purchase upon both kinds of stock. He did not know whether there was any reply to that; if so, he would read it; if not, he would say that it was declined, and that the Company did not consider the offer adequate.

Mr. MICHAEL: We do not say it is inadequate. We decline the offer.

Mr. POPE: Very good. We will take it so.

Mr. Easton, C.E., said he had found great advantage to result from the water supply being in the hands of Local Authorities. He had had practical experience in more than one instance of this advantage, and he was decidedly of opinion that, especially with regard to the supply of the poorer parts of a town, things were better managed where the supply was in the hands of the Sanitary Authority, because the supply was not dependent on the profit of the undertaking. He had been consulted in many cases of transfer to Corporations by voluntary arrangement, and also in cases of compulsory purchase, as at Birmingham.

Mr. MICHAEL: There have been only two such cases, and in one—the Stockton case—the matter is not yet concluded.

Sir J. DUCKWORTH remarked that there were peculiarities in that case.

Witness (continuing): I think the offer made by the Corporation is the full and fair value of the undertaking. The offer made is as much as the Corporation ought to give for it—quite the maximum.

Mr. POPE: Do the reasons which you say generally prevail in favour of the transfer of water-works to Corporations, prevail in a more or less degree with regard to Cheltenham?

Witness: They apply with greater force in the case of Cheltenham, than in any case that has come before me, the fact being that the poorer classes of houses are not supplied at all. The Company have simply taken the better houses, and left the poorer classes to shift for themselves. I have taken the calculation of Mr. M'Landsborough, and find there are 9137 houses in Cheltenham district, with a rateable value of £244,000, and a probable population of 52,700. Of these, 3100 houses, or about one-third, are supplied by the Company, of a rateable value of £145,000, or about one-half the total value, and a population of 18,500, or little more than one-third. Not more, therefore, than one-third of the population is actually supplied, and the class of houses not supplied is just that to which, if the supply is not the more valuable, it is occupied by those least able to supply themselves. The extreme daily supply of the Company in time of drought is 5 gallons per head over the total population, or 12½ gallons on the population actually supplied—a total supply having been stated of 231,000 gallons. That is not a state of things that ought to have been permitted to exist since 1865.

Mr. POPE: Speaking apart from the *laches* of the Company, and merely as a Water Engineer, which scheme do you think is the better for Cheltenham?

Witness: I am of opinion that the Dowdeswell Valley scheme is decidedly the better, for two reasons—first, the water is better; and, secondly, the expense is much less, both as to first cost, and also as to working expenses afterwards. It therefore must be better in the interest of the ratepayers. I have been carefully over the quantity of water, as gauged in the springs, and over the calculations of Mr. Bateman, and am prepared to support them to the fullest extent. I believe an adequate supply for many years to come can be obtained, and, knowing the watershed for many miles, I believe there are other springs that may be brought into the system, and at a low cost. The circumstances of Cheltenham are not such as those of Manchester, the population increasing at a very moderate rate, and there being no large demand for trade purposes. I believe that the interest of the town would be best promoted by the Corporation scheme.

Cross-examined by Mr. MICHAEL, witness said he had not calculated the extent of the watershed himself. He had taken the figures of Mr. Bateman and Mr. Hawksley, and had not gone into them himself. He contemplated a supply of 1,000,000 gallons per day by the Corporation scheme. He allowed for 90 days storage, which he considered to be quite sufficient in the case of a town like Cheltenham. It was found sufficient in the case of Falmouth. He did not know there was a large difference in the rainfall of the two places; he believed it was about 30 inches each. He did not believe the Falmouth rainfall was 40 inches. He did not know anything of whether the Corporation had conformed to the requirements of the Public Health Act with reference to the Company. There was an objection on the part of the ratepayers to the putting in force of those requirements when a Company were concerned, because of the payment of profit to a private undertaking. He considered that the Company had been in default since 1865, when they admitted they had only 5 gallons per head per day, and they had no more now.

By the COMMITTEE: The peculiarity in the Stockton case was that the Company there were not only paying statutory dividends, but had in hand an income of from £8000 to £10,000 beyond, and an ample supply of water.

Mr. MICHAEL: Ought you not to say that they had applied twice to Parliament for a further supply?

Witness: I was going to add that they applied a second time for a supply from the very same source that had been before refused.

This concluded the evidence.

Mr. POPE then summed up the case for the Corporation. He said that the question to be decided in this case depended on two or three broad principles and one or two leading facts, rather than upon any details, however interesting those details might have been. He might at once admit that it had not been usual—in fact, it had been very unusual, for Parliament to compel the acquisition of private undertakings; but Parliament had set itself to promote such acquisition, though it had hesitated to place its hands compulsorily, except under exceptional circumstances, upon the property of Shareholders. But it would be well to look at the policy of Parliament as well as at what it had done in specific cases. With this view he referred the Committee to the Public Health Act of 1875 as the latest exposition of the opinion of Parliament, and which he would strive to apply to this case. If they referred to section 81 they could not doubt that Parliament meant to say that, if they had to start this question again, the proper parties to supply water for a district were the Local Authority, because the operation of sections 51 and 52 was to give the Local

Authority power to supply water subject only to such restrictions as Parliament considered necessary for the protection of Water Companies. Section 51 gave power to acquire existing water-works; but section 52 provided that before obtaining a supply of their own, the Local Authority should take certain steps which were considered to be sufficient and proper to ascertain whether the Company were able and willing to perform the statutory duty which Parliament cast upon them. That was, the general mind of Parliament was shown to be that Local Authorities were to be authorized to establish works of their own rather than to acquire water, under certain circumstances; and it would be consistent with the principle established by Parliament that the Committee should, in this instance, authorize the works the Corporation felt disposed to carry out, rather than give them the works of the Company; and he told the Company now, as he told the Committee, that the Corporation had asked for the power they had, not because the Corporation wished to acquire the works of the Company, but in order to get a supply for Cheltenham; and if the Committee would strike out the compulsory provisions altogether, and allow the Corporation to have the supply they asked for, they would be quite satisfied with the decision. But he knew the Company would say that that was unfair to them, and he wished it to be understood that the Corporation admitted it, but that they did not wish to acquire the Company as a source of profit, for they did not consider they would repay themselves at the offer they had made; but they thought it fair, though not necessary, that when they came to ask for new works they should also come for powers to buy the Company out. But if the Committee were satisfied that the Company had been guilty of *laches* in times past, it would be quite within the spirit of parliamentary practice to give the Corporation power to form works, even though they did not give the power to purchase. But he did not suppose that the Company would ask the Committee to split the Bill in this way. That, however, was the basis on which the Corporation applied to the Committee; if the Company were unable to do what they ought to do, power should be given to the Sanitary Authority to do it. The Corporation started with this proposition—that since 1865 the Company had kept Cheltenham short of water, notwithstanding frequent protests from the Corporation (whether in the form provided by the Public Health Act or not) and they had this fact conceded by the Counsel of the Company, that they would have continued to keep the town short, but for the action taken by the Corporation in promoting their Bill. Mr. Venables expressly said that the Company's Bill was introduced in consequence of the Corporation bringing in their Bill. By the confession of the Company the necessity of the application on the part of the Corporation was admitted. For 13 years there had confessedly been no sufficient supply of water; there was still not water enough; and there would have remained not water enough if the Corporation had not introduced their Bill. If anything were needed to show that the Company were not prepared to do their duty, was not the proof conceded, and were not the Corporation justified in saying that in accordance with the spirit of the Act of 1875, the Committee were in a position to authorize the Corporation to form works of their own, because the present works were in the hands of a Company who were not prepared to supply enough water for all reasonable purposes? Supposing the Corporation had founded their case upon the speech of the Counsel for the Company, and without a particle of evidence, was there any answer to the proposition? Some answer was suggested to it by Counsel, in the question, had the Corporation complied with the provisions of the Act? If those provisions had been complied with, and the Company had failed to supply what was required, it would not be necessary, except as to the acquisition of land, &c., to come there at all. Under sec. 52, except as to getting powers to acquire land, the Corporation would be able to have works of their own with or without parliamentary sanction; but before doing so it was necessary to give notice to the Company in a certain manner, and no such power was given so long as the Company were able and willing to supply water for all reasonable purposes required; and any differences as to whether the water was sufficient or reasonable were to be settled by arbitration. But in this case no arbitration was necessary, because it was conceded by the Company that they had not a sufficient supply, and that they would not have come to Parliament now if the Corporation had not done so. But even if the Company alleged that all the proper measures were not enforced, they had heard from Mr. Brydges the reason why the Corporation could not enforce them, because the Company were not prepared to supply closets without an extra charge, which the Corporation were not able to exact. Without any question of Severn water or spring water, they had a Company who had existed for 13 years without the power to supply Cheltenham, and they only applied now for that power because the Corporation had also come to Parliament. And the principle upon which Parliament had legislated was that, if a Company were not able to supply a town, the Corporation should have the power to do so given them. If the Company would ask the Committee to throw out the purchase clauses, he should be content, if the Corporation were given the power of supply they asked for, knowing, as he did, and as the Company knew, that it would ultimately lead to the purchase of the works. If the condition of things was as he had stated, was not this a case in which the Corporation were justified in their proceedings? Not only for thirteen years had the Company left Cheltenham without an adequate supply, but they now came to Parliament with a scheme of supply which was rejected in 1865. If there was any need of analogy between this case and the case of Stockton, it was to be found in this fact: After leaving the borough for thirteen years in a condition of water famine, they now come before Parliament with the same scheme which was rejected in 1865, and without the insertion of the provision for the dual service which was imposed upon them in 1865. He did not ask the Committee to decide between the doctors in this case, but he thought he should speak the sentiments of all laymen when he said that he should not be satisfied to drink water because Dr. Tidy said it was safe to drink it when other scientific men, quite as able, declared to the contrary. The gist of the thing was, that experiments such as these, as to the unwholesomeness of the water, were experiments which were especially undesirable in the case of such a town as Cheltenham, and where there was so strong a feeling against it, Parliament ought not to impose water upon a town when the governing body of that town were willing to provide a supply elsewhere, and from an unobjectionable source. But the Company were asking Parliament not merely to gloss over their shortcomings, but to force upon the people of Cheltenham, in the Company's own interest, a supply which a large proportion of the people believed to be injurious, and in face of the fact that they were prepared to supply themselves from a source against which there was no complaint, and at a much shorter distance. He was not going to ask the Committee to say that the Severn water was not fit for domestic use, but he did say that whether it was so or not, if the supply could be obtained from a source against which there was not even, it may be, a fancied objection, the preference ought to be given to it. Supposing the Severn water to be fit water for Cheltenham, were the Committee going to force it upon the people and make them adopt it when they were willing to get their own supply? In the petition of the Company against the Corporation Bill not a word was said against the estimates or the quantity of the water, and but for the fact of the Company themselves going to the Severn there would



not have been a word said against the Dowdeswell scheme. Was it unfair to say that the Committee were dealing with a Company who not only had not done their duty for 15 years, but were now seeking to force upon the town a supply which it objected to, with the only excuse that Dr. Tidy said the objections were fanciful? The Committee were not dealing with a town that required a large supply of water, and in which the abundance of the supply might make up for a deficiency in quality, but the prosperity of Cheltenham depended, so to speak, upon "fancy," and upon the reputation it bore with people who resorted to it for health, or who, having relinquished the active pursuits of life, went to it to spend their days in a place which they believed to be a healthy one, and for its pleasant associations. As the noble Chairman of the Lords Committee said in 1865, any notion that the water supply could not be depended on would be ruin to a town like Cheltenham. It was one of the sanatoria of the country, as one of the witnesses had said, and it ought to be maintained so, without forcing upon its inhabitants a supply to which there was so strong an objection. Were the Committee going to send the Corporation back to Cheltenham, and compel them to say to their people, that notwithstanding what was said by a man like Dr. Frankland and by their own Medical Officer of Health, they were, by the decision of a Parliamentary Committee, forced to impose this water upon them? He asked the Committee whether he had not carried this case beyond the provisions of the Public Health Act, because he had proved that the present application of the Company was wrong in its inception, and because it sought to force upon Cheltenham a supply which a large majority of the community fancied, at any rate, would be an injurious one. He did not propose to say more. He did not propose to go into the details of the evidence. In the hands of Mr. Bateman he felt sure that he might leave those details, so far as the engineering works were concerned, and he quoted from Mr. Bateman's evidence to show that the proposal of the Corporation was equal to a supply four times the quantity now required by the town, and to a supply of 20 gallons per head daily, which was held to be amply sufficient for a town like Cheltenham. The whole of the case lay in this: If Parliament, in the Act of 1876, expressed the opinion he had tried to draw from the construction of the Act itself, were the Corporation not in the position of a public body seeking to construct works which Parliament said ought to be permitted where the Company were not equal to the supply? Had the Corporation not brought themselves into a position to acquire the works, not as wishing to make a profit from them, but as avoiding the competing works which would otherwise be necessary? And had not the case been brought within the precedent of Parliament when the Company, for 15 years, had not carried out their duty, and now only proposed to apply for a supply which Parliament had before rejected, and without the provision which Parliament had imposed.

Sir E. BECKETT replied upon the whole case. He said he should like to know within what precedent the Company had been brought. The Stockton case had been referred to, but he did not wonder that it had been touched very tenderly, for his learned friend must be quite aware that no precedent was established by it. There was indeed no such precedent. Mr. Pope had himself opposed a similar proposal in the case of Ramsgate; Nottingham was another instance, and at Sheffield the Bill was completely abandoned because of an adverse decision given just previously. In not a single case had a Corporation been allowed to set up a Bill of their own when a Company were before Parliament. He disputed that the policy of Parliament was as argued by Mr. Pope with reference to the Public Health Act, and referred to the Municipal Corporations (Borough Funds) Act in support of his contention. That Act was passed to enable Corporations to go to Parliament to oppose Bills and to give them the power they did not before possess to charge the costs in the case of failure and, under certain conditions, upon the rates; but that power was expressly governed by the condition that Corporations should not apply the power to the starting of any competitive works to existing Water or Gas Companies. Could there be any stronger indication than this of the will of Parliament? The results of such applications, within his experience, extending over the past 30 years, had been that Parliament had uniformly laid down that Corporations should never be allowed to establish competing works against existing Companies. He knew of cases in which the supply of water was admittedly inadequate, but in which it had been always laid down that before a Corporation could furnish a supply the existing works must be purchased. There were terms on which this Company, being merely a trading Company, would consent to sell their works, and there were also terms on which they could not be expected to do so; and under this latter category he classed the offer now made by the Cheltenham Corporation. He read the letter from the town clerk, as already given in evidence, and said he need scarcely dwell upon the arbitrariness of its proposed mode of dealing with the Company. How did the Corporation know what were the debts or obligations of the Company? What about the costs of these proceedings? The offer was one which he objected to not only for the manner in which it was made, but as one by which the Shareholders in the Company would not be allowed to go out of the concern with the same income as they now derived from it. He asked any of the Committee having land which was required to be taken compulsorily, what they would think of an offer to pay them only as an annuity what they had been receiving from it hitherto? They all knew the sort of terms which were usually given in such cases, and they were terms very different to these; these were such as merely supplied the data from which an arbitrator would work. In the Stockton case, though the result was not yet known, the arbitrator was authorized to give something for the compulsory purchase and something for the prospective profits of the Company; but nothing of the sort was done in this case. The offer was, indeed, ridiculous; nay, it was more than ridiculous; under the circumstances, it was an insult, not only for the matter of it, but for the manner in which it was communicated. The Stockton case was the only case in which compulsory purchase was sanctioned, and he read from the Act authorizing it to show that the circumstances were exceptional; and though in that case the award of the arbitrator was not yet given, they might be sure that something substantial would be given for the compulsion. So that in addition to the 25 years purchase offered by the Corporation in this case, the Company were entitled to a sum for compulsory purchase and for prospective profits. He asked who would put this at less than an additional five years purchase; but even putting it at an additional two years, one for the compulsion and the other for prospective profits, it would be sufficient for his purpose and to show that the offer of the Corporation was not one that could be entertained. Referring to the Birmingham case, he argued that that was not a case of compulsion, inasmuch as it was based upon an agreement between the parties, and that as to the proposal to sanction a competing scheme there was no case of the kind. He was anxious to see how his learned friend would deal with the scientific evidence in the case, and he (Sir E. Beckett) remarked strongly upon the absence of any comment thereon, and characterized the opposition to the Severn water as founded, like that to the Thames, upon the "monthly guesses" of Dr. Frankland, whose evidence and theories he denounced in the strongest terms, as also those of his "usual satellites," Dr. Hill and Mr. Way. His friend had found it impossible to stand by the evidence of his scientific witnesses, and had there-

fore thought it right to drop them, and to rely upon the sentiment of Cheltenham. If the sentiment of Cheltenham was sufficient to make them buy the works of the Company at a fair price, he was quite content to let that sentiment have its way; but the fact was they wanted to indulge their sentiment and yet have the works at their own price. To indulge such a sentiment at the expense of the Company was a proposition which Parliament never entertained, and, he believed, was not likely to do. Referring to the proceedings of 1865, he said it appeared to have been forgotten that the House of Commons then passed the Bill of the Company, and passed it after a mode of inquiry, which then prevailed, by referees who reported on the good quality of the water. Instead of asking Parliament to reverse its former decision, he asked the House of Commons to uphold the decision it had before come to. It might be said that the House of Lords, when it threw out the Bill as regarded Cheltenham, had something before it which was not before the House of Commons. But was it so? If so, why was the Bill sanctioned as to Tewkesbury? The decision to grant the supply to Tewkesbury affirmed the satisfactory character of the supply, and as to Cheltenham, the imposition of the dual service was made under a misapprehension, and without taking into account the fact which had been stated in evidence, that the supply needed for Cheltenham was only required for domestic purposes. The compromise thus suggested by the House of Lords in 1865 was impracticable, and he argued that it was the Company and not the Corporation who were now carrying out the wishes of the one House explicitly, and of the other inferentially. Having remarked on the absence of any witnesses from Tewkesbury against the Severn water, and upon the strong evidence in its favour from that place, the learned Counsel said that since then the Rivers Pollution Act had been passed, and, though he did not say that as a matter of sentiment, it was not preferable to have the sewage taken out of the Severn, the Pollution of Rivers Act was passed to effect that object, and it was strange now to come and say that the water was not to be taken because of these things which the Act had given the power to remove. As to the Company having been in default since 1865, had the Corporation forgotten that about that very time the Commissioners rescinded the resolution they then had on their books requiring the Company to provide an additional supply? From that time down to the present the resolution had not been renewed, the reason being that the town had ever since been afraid, by renewing it, to make the works more profitable, having the purchase of those works in view. That showed the regard they had for the interests of the town. The Corporation had been proved to have asked the Company to do nothing that they had not done, and the Corporation had given no indication of their need, except by coming for this Bill, which was a very improper mode of indicating it, and one the cost of which they would be unable to recover under the Borough Funds Act. The Corporation had given no such indication, because they knew that the Company would have to go to the Severn, and that then they would be in a better position to meet them. No comment had been made by Mr. Pope on the sufficiency of the supply proposed by the Corporation; but Mr. Bateman's estimate, after scraping up the springs from all parts, only provided for a supply of 20 gallons a day to the present population, without any provision for future increase; and then only by providing for 180 days supply; but the learned Counsel asked if that was such a supply as a Company could contemplate. There could be no doubt that as regarded the Chelt scheme a blunder had been made, the author of which, unless it was the geological doctor, he did not know. He contended that the engineering details were as bad as every other feature of the case. In concluding, the learned Counsel said Mr. Pope had avoided touching upon the chemistry of the case, he had declined to touch the engineering aspect of the case, and he had failed to quote any precedent for the present application; while legality had been distinctly violated, in the bringing in of a Bill for a new supply in competition with an existing Company. The Corporation Bill was for an inferior and an inadequate supply and was one for the confiscation of the Company's property. If the Bill of the Corporation was now thrown out, he reminded the Committee there was nothing against its being renewed when the Corporation chose to behave fairly or even honestly in their effort to acquire the works of the Company.

The room was then cleared, and the Committee remained in consultation for half an hour. On the re-admission of the public,

The CHAIRMAN said: The Committee find the preamble of No. 1 Bill (the Water Company's Bill) not proved. The Committee now wish to inquire if there is the possibility of an arrangement for the voluntary purchase of the Company's works.

Mr. BROWN asked for an adjournment to consider the question, which was granted.

TUESDAY, MARCH 19.

Mr. POPE said that since the decision of the Committee on the previous day, the Corporation had placed themselves in communication with the Company, and proposed a meeting for the purpose of endeavouring to come to an arrangement. The Company, however, declined the invitation, not feeling, as they said, that it would be desirable. That morning, however, an offer had been made by them to withdraw opposition to the Corporation Bill, on the same terms as Parliament had given in the Stockton and Middlesbrough case. The proposal, he supposed, was that terms such as those in the Stockton case should be inserted in the Bill. He might at once say frankly that, knowing the proceedings in the Stockton case, he could not advise his clients to proceed with a Bill in which such terms were inserted. The two cases were not analogous, and seeing that the insertion of such words as were used in the Stockton Act, made an allowance of compensation for compulsory purchase and prospective value a statutory direction to the Arbitrator, he held that the Company were not entitled to such compensation in this case, and he objected to such a statutory direction. The Corporation were quite content to go to an open arbitration, or, being anxious only for an adequate supply of water, they would be quite content to go on with their Bill, giving the Company power to call upon them, at any time within five years, to purchase their works by arbitration. While they were not willing to accept, for the relief of Cheltenham, any Bill containing such conditions as in the Stockton case, the Corporation were prepared either to submit to arbitration or to take their Bill on the conditions he had stated.

The room was then cleared, and on the parties being re-admitted, The CHAIRMAN said the Committee regretted that the opportunity furnished for coming to an arrangement for voluntary purchase had not been successful, owing to the fact that the Company insisted on terms drawn from the Stockton case—a case which the Committee considered not to be analogous. He advised them again to consult with a view to a further proposal, and said that for this purpose it might be desirable to adjourn until a later hour in the day.

On the re-assembling of the Committee,

Mr. POPE said an agreement had been come to between the parties, the heads of which he would read. They were—

1. The Corporation to pay 25 years purchase of the dividends paid by the Company on their different stocks, taking the dividend on their ordinary stock at 10 per cent. The Company to have the option of perpetual annuities to this amount, or a capital sum equivalent thereto.



2. The Corporation to pay to the Company a sum of £5000 in discharge of all debts and liabilities, exclusive of mortgage debt.

3. The Corporation to continue payment of two small annuities of £100 a year and 6s. a week, to which the Company are now liable.

4. The Corporation to continue to employ the Company's Manager for three years, at his existing salary of £600 a year, or give him compensation.

5. The works to be taken over from the 24th of June next, up to which time all receipts are to belong to the Company, and all liabilities to be discharged by them.

The Committee then adjourned to give time for the foregoing terms to be embodied in the Bill.

## Miscellaneous News.

### METROPOLIS WATER SUPPLY.

#### METROPOLITAN BOARD OF WORKS.

##### ABANDONMENT OF THE WATER BILLS.

At the Meeting of the Board on Friday last—Sir J. Hogg, M.P., in the chair,

A report was presented by the Works and General Purposes Committee recommending that monthly gaugings be taken, at a cost of about £120, of some of the more important chalk wells which have been measured during the past few months, so as to complete a year's gaugings.

Mr. RUNTZ moved the adoption of the report.

Mr. WATKINS said he decidedly objected to the recommendation. This was a proposed continuation of the costly experiments which had been undertaken for the purpose of procuring evidence in support of the Water Supply Bill. The Board had been promised, on the condition that a certain motion was withdrawn, that no further expenditure should be incurred in respect of this Bill; but now they were asked to consent to an additional outlay of £120. He thought this would certainly be a waste of public money, and he trusted that the Board would not assent to the suggestion.

Mr. LEGG asked if any idea could be given to the Board as to the actual amount already expended in these gaugings.

The CHAIRMAN said he could not tell.

Mr. H. L. TAYLOR said he should consider the expenditure was most desirable if there was the least chance of the Board ever being entrusted with the control of the water supply of the Metropolis. But did any one believe they would? Therefore the proposed outlay would be a positive waste of public money for no purpose. These gaugings might be of value to some professional men—he did not deny that, but he doubted whether the Board were justified in spending the ratepayers' money in gaining information for the enlightenment of outside professional men. It was not a question of amount, but of principle. Would the Board spend £120 for such an object?

Mr. WALKER: I hope so.

Mr. H. L. TAYLOR: I know there are some members of the Board who have water on the brain.

Mr. WALKER said he could understand the reason of the opposition of the honourable member for the City of London. It all arose from jealousy, and because he knew that, if the Water Bills had gone forward, the Corporation would have had to take water from the Metropolitan Board.

Mr. FREEMAN expressed himself favourable to the outlay, in view of some future action on the part of the Board.

Mr. CUFFLIN said the Board had, it was true, resolved to spend no more money in this direction, but the present recommendation related to an exceptional matter. Whether the Board should adopt the recommendation of the Committee depended very much upon what answer could be given to Mr. Legg's question. If a large sum had already been expended, it might be worth the supplemental outlay even if greater than now asked for, to continue and complete the investigations even if it were only for the benefit of professional men hereafter. As to what the actual cost hitherto had been, he thought the Engineer could easily answer the question.

The CHAIRMAN said he was just about to suggest that Sir Joseph Bazalgette, who made the recommendation to the Committee on the previous Monday, should state his views to the Board. The Committee were anxious not to expend any more money themselves, and thought it better that the step, if taken at all, should be taken by the Board.

Mr. LESLIE said he should like Sir Joseph to inform the Board what he considered "the more important chalk wells."

Sir JOSEPH BAZALGETTE: In the first place, I wish to say that I believe there has not been a large expenditure upon this branch of the inquiry. But the importance of the inquiry does not depend upon the amount expended. I cannot name the figure, but I think I can say it is comparatively a small one. It is exceedingly important that the inquiry, which was commenced some few months ago, to be made complete, should be continued for a year, that we should know the exact amount of rainfall at different periods, and this cannot be determined unless the inquiries extend over a year. The information already obtained is incomplete unless we know the quantity of water in the chalk wells in the remaining months of the year, and the extent to which the yield is affected by the rainfall. As to which are "the more important chalk wells," what I mean is this: We had some 400 wells gauged in the area on the south side of the Thames, and probably the same number on the north side. Now, with the view of making the continuation of these experiments as economical as possible, I do not propose to continue the inquiries in regard to the whole of them, but to take certain lines or sections across the chalk, which show the flow of water underground, and make the experiments upon the wells lying in that direction. These I call the more important on account of being largely on the line in which we find the water in the chalk is flowing. Probably about half the former number experimented upon will be sufficient.

Mr. WATKINS: Considering the large amount of rainfall during this year, will the information you are now obtaining be of any use should next season be a dry one?

Sir J. BAZALGETTE: We do not know that there will be a larger rainfall than usual this year. There has been an extraordinary rainfall for a short time, but it does not follow on that account that the average of the year will be larger than usual. We want to know what effect the rainfall has on the chalk, the time it takes to reach the chalk, and how far it varies. What the result will be can only be ascertained by inquiry.

Mr. LESLIE: I should like to ask whether all this information is not to be found in the proceedings of the Institution of Civil Engineers.

Sir J. BAZALGETTE: No. I have made very careful search into the records of the Institution, and such information does not exist.

Mr. LEGG: When did these gaugings of yours commence?

Sir J. BAZALGETTE: I think we commenced in November last, and therefore should continue to the same period this year. I have estimated the expenses as nearly as possible.

Mr. H. L. TAYLOR: I should like to know whether the information you are seeking will be of any advantage to you in connexion with the main drainage of London.

Sir J. BAZALGETTE: No.

Dr. BREWER having supported the recommendation of the Committee, The report was adopted.

The Works and General Purposes Committee brought up another report, which stated that they had proceeded, on the resolution of the Board of the 17th of April last, referring it to the Committee to consider and report as to the course to be taken with the two Bills relating to the water supply of the Metropolis, and they had arrived unanimously at the conclusion that, on the ground that the session is so far advanced, and having regard to the state of the business in the House of Commons, the Board do request the Chairman to take such steps as may appear to him expedient to stay any further proceeding on the two Bills.

Mr. RUNTZ, in moving the adoption of the report, said the Committee came to this conclusion with great reluctance. They felt the importance of going on with the Bills; but, under the circumstances, having regard to the fact that, if they got the Bills so far advanced as to come before a Select Committee, a large expenditure would be incurred for professional evidence, without any hope whatever of passing either measure this session, they had resolved unanimously to recommend that both Bills be withdrawn.

Mr. LEGG said he rose with a great deal of pleasure to second the motion.

Mr. WALKER said he should move an amendment. The whole of the vestries, with the exception of St. Pancras, were ready to uphold the Board in going on with the Bills, and the Board had no official intimation that the Government would oppose them. To abandon the Bills at this time would be the triumph of might over right, of dirt over cleanliness, and therefore he would move—"That the Board request the Chairman to take such steps in promoting the two Bills as may appear to him most expedient in the interests of the ratepayers."

The amendment was not seconded. On the motion being put,

Mr. Cook said he wished to offer a few remarks. He felt great disappointment when he saw the recommendation of the Committee. A question of such importance as that of the water supply of London ought not to have been dealt with in the way in which the Board had dealt with it—first going on, or appearing to go on, with the Bills; then, frightened with the threatened opposition, withdrawing; and at length abandoning the scheme. If they were not prepared, after all the attention bestowed on the matter, to carry the Bills through, they ought never to have introduced them; if they believed the course hitherto taken was right, they should back them up with all their power. The recommendation of the Committee was a recommendation in the interest of delay, and he asked himself the object of delay. Very often delay was advisable so that time might be afforded for gathering up energy for a more vigorous progress hereafter. He did not believe the Committee had that object in view. He suspected delay was recommended so that the Board might drop the Bills this session and not re-introduce them next session. But why withdraw them? What was the nature of the opposition? Was it other or greater than they might have expected when the Bills were brought forward? Did the Board expect for a moment, when they resolved to introduce a Bill for the purchase of the water undertakings, that they would not have the opposition of the Companies? Did they suppose that the Gas Companies would not unite with the Water Companies in their opposition? Why, it was well known that, whenever a Bill was brought forward affecting any Joint-Stock Company, all the other Companies of that kind united to oppose and defeat it. One of the arguments used against these Bills was the enormous expenditure which the schemes they proposed would involve. But the figures brought forward by the officers of the Board clearly showed that, if they purchased the Water Companies at the present time, the inhabitants of the Metropolis would shortly be saving money by the transaction. It was quite a misrepresentation to speak of the purchase as involving expense; it was in reality a saving of expense. The ratepayers had to pay water-rates now; they would only have to pay water-rates then—it would simply be doing the same thing in another form. What other opposition was there? He saw it stated in a newspaper some time ago that the Board had not sufficiently considered this scheme; that they had gone rashly into the matter. He could only say, in reply, that he had been a member of the Board for a great number of years, and during the whole of that period the water question had been constantly before them, and they had been assisted in coming to a sound judgment upon it by the evidence taken before Parliamentary Committees and Royal Commissions. In truth, it was the Board who had looked into the question, while those who set themselves up as critics of the Board had not properly considered it. Then it was urged that the Board were not the right authority to undertake the purchase of the Companies. Perhaps so, but then in municipal matters they must work with the best material at their disposal. If there were a larger municipal body in existence in the Metropolis, doubtless that would be the proper authority; but while Parliament was making up its mind as to what should be the future constitution of the Metropolitan Municipality, surely the public were not to be deprived of the best means at their disposal to remedy the existing state of things in relation to the water supply. The Board, as representing the ratepayers of London, felt it a duty to bring forward the Purchase Bill, and, until the constitution of the Board was altered, they could not be fairly blamed for endeavouring according to their lights, and on the best advice they could obtain, to put the water supply on a more satisfactory footing. The only important reason he had heard why the Board should now withdraw the Bills was the intimation given by the Home Secretary to a deputation which waited on him. He admitted that when an intimation came from a high official that he did not believe the Bills could be got through Parliament this session, there was something to act upon. But, upon examination, he (Mr. Cook) did not think that, after all, this was a reason for withdrawing the Bills. He confessed that he was disappointed with the statement made by the Home Secretary, as a member of a Government which came into power, taking for its programme *sanitas sanitatum*. Considering that there could not possibly be a more important question than the supply of pure water to this large Metropolis, he felt grieved that the Home Secretary should have intimated that the Board must not expect the Government to give their Bills its support. But having, at great pains and expense, brought forward their Bills, his advice to the Board was to go on with them, and let the House of Commons take the responsibility of their rejection. If they failed, let the people of London know that the fault lay with the Legislature, and not with the Board. The Board had already incurred the greatest amount of expense, which the promotion of the Bills involved, let them now go forward and meet their fate; let not the public say that the Board were faint-hearted. It must be borne in mind that they would never be able to purchase the Companies so cheaply as at the present time. Many millions of money would be saved if the Bill for effecting that object was passed in the present session. He hoped that there would be found a majority of the Board prepared to cast upon Parliament the responsibility of stopping or rejecting this great scheme, which was the most important they had ever brought forward in the interests of the inhabitants of the Metropolis.

Mr. FREEMAN said he had not lost one iota of his confidence in the correctness of the step taken by the Board in introducing the Bills, but at the present time the question was the proper course to be adopted



respecting the Bills, considering the circumstances of the case. The Board did their duty in bringing these Bills forward, but he had always felt that their fate depended principally upon the attitude of the Government. The Board could never hope to contend successfully against the opposition of the Companies, if the Government declined their assistance. Why did the Government oppose the Board in this matter? It was no use blinking the question—the Government had never done anything to make enemies for themselves. That being the case, it was for the Board to consider the most prudent course for them to pursue. If it were true, as stated by the last speaker, that the Board had already incurred the largest expenditure involved in the prosecution of the Bills, he would say, let them go on; but he believed the expenditure yet before them would be much larger than any they had yet incurred. With the Government against them, with an extraordinary amount of indifference towards the measures on the part of the inhabitants of the Metropolis, and with the vigorous opposition of the Companies, it was hopeless to expect they would succeed. He hoped that some future Government would feel it their duty to support a Bill for placing the supply of water to London in the hands of a central municipality.

Mr. ROCHE said he trusted that what had taken place in the House of Commons would be a lesson to the Board as to how they should introduce their Bills in future, and that when they found they were to be met by this persistent opposition, in the form of delay, with reference to their Bills which were introduced as public Bills, and that they were prevented from taking the opinion of the House of Commons on the second reading of those Bills, by reason of the forms of the House, which forms were made subservient to the interests of those who wished for delay, he hoped they would for the future adopt a different course, and introduce their Bills as private Bills, so that in the ordinary course they must come before the House, and the House must give its decision in regard to them. It must be borne in mind that the Board had two Bills before Parliament. There was the Supply Bill, to which, no doubt, there was considerable opposition in certain quarters. But the House of Commons had sanctioned the principle of that Bill by passing the second reading. It was no use for any one to attempt to delay that one. Its opponents never ventured to divide the House upon it, and its position now was that it was ready for a Select Committee. But it was advisable that the Purchase Bill should be referred to the same Committee, and, notwithstanding the latter stood for second reading on the 12th of March, and had been set down for that stage on several subsequent nights, the forms of the House had prevented it from proceeding. Under the circumstances the Board had to consider what was the proper course to pursue. Would they keep the Bill in existence merely for the chance of getting the opinion of Parliament on the second reading, knowing that they could not hope to pass it through Committee with any prospect of taking it up to the House of Lords this session? If not, there was no other course to adopt than to instruct the Chairman to take steps to withdraw it, so as to prevent useless expense being incurred. And let it be remembered that the Board would not thus be placed in any worse position than the Government itself would be sure to be in before long with regard to many of its own Bills. There would sure to be a considerable "slaughter of the innocents" by-and-by. He confessed that he was not surprised at the course the Government had taken with regard to these two water Bills. The Government was not desirous of mixing itself up in measures which might raise considerable opposition by interested parties. No useful purpose could be served by continuing to keep these Bills before Parliament; the wisest course, therefore, was to withdraw them, leaving the Board to determine next session what course they would adopt.

Mr. LESLIE said he observed that the last speaker was smiling the whole time he was addressing the Board, knowing as he well did that he himself was the cause of the whole mischief, and of the enormous expense to the ratepayers of the ridiculous measures called the public and private water Bills. Those who opposed these schemes from the beginning candidly stated their reasons for so doing, while those who promoted them shut themselves up in a small Committee, and lavishly expended the ratepayers' money. For whose benefit?

Mr. RUNTZ rose to order.

The CHAIRMAN ruled that the honourable member ought not to refer to professional men who had been engaged by the Board in connexion with these matters.

Mr. LESLIE said he was only going to refer to the Board's own minutes to show that thousands of pounds had been received by those Engineers. He had made his objection before the Board's Auditor, but was not successful in getting these payments disallowed. He was amused to hear Mr. Freeman say that, if the present Government would not help the Board, they must wait, and try another. He fancied they would have to wait a long time, for they would not have much chance of carrying such Bills as these until the honourable member himself was Prime Minister. After what the Chairman told the Committee at their last meeting, to the effect that the Government intended to oppose these Bills, and would vote against them, it was, of course, impossible to hope for success, and therefore the best thing for the Chairman now to do was to try to get out of the scrape as soon as he could. It was to be wished he could get the ratepayers out of the scrape as easily. Unfortunately they would have to pay pretty dearly for this whistle, much dearer than when the Board took up the gas question. This little fantasy of Mr. Roche and Mr. Freeman would cost the ratepayers not less than £12,000.

Mr. H. L. TAYLOR said he thought they would have acted with more discretion if they had adopted the recommendation of the Committee without any observations whatever. For himself, he had always protested against a public body like the Board or the Corporation of London undertaking the question of buying up the Water Companies. Nevertheless, he thought that when the Board did enter on the discussion of so important a question, and every argument, *pro* and *con*, had been brought forward, the minority should give way to the majority with regard to the prudence of going to Parliament for the necessary powers. This question had been before the House of Commons, and they must assume that the Chairman had done his best to help forward the Bills. There could be no doubt that, owing to the Chairman's political opinions agreeing with those of the present Government, facilities had been given to him which would not have been given by another Government. Surely now, then, was the time, if ever, when the Board might hope to succeed, and if with all their present chances they failed, he, for one, doubted whether they would carry their point, even with Mr. Gladstone as Prime Minister, and Mr. Freeman as Chancellor of the Exchequer. Discretion was the better part of valour, and, therefore, the wisest course open to the Board was to instruct the Chairman to withdraw both Bills at the earliest possible moment.

Mr. RUNTZ said that, after some of the observations that had been made in the course of the discussion, it might be supposed that the Board were becoming lukewarm on the subject of purchasing the water undertakings. That, however, would be a great mistake. Ever since the year 1867, when a Royal Commission was appointed to consider the question, there had been a growing feeling in favour of the transfer of these works to a public authority, and immediately after that Commission presented its report in 1869 the Board resolved to act upon its recommendation. Subsequently a deputation waited upon the then Home Secretary, Mr. Bruce, who inti-

mated his opinion that nothing could be done until an alteration had taken place in the Municipal Government of London. Yet, in 1871, the Government itself introduced a Bill to enable the Board to buy up the interests of the Companies. In consequence, however, of the opposition of the Companies, the Bill was hastily withdrawn without any reason being assigned, and a Regulations Bill introduced in its stead. The Board felt then as they felt now, that it was exceedingly desirable that the Companies should be abolished, and that the supply of water should be vested in some public authority. It must be borne in mind that the longer the accomplishment of this object was delayed the more costly would it become. The income of the eight Companies in 1856 was £300,000, in 1866 it was £500,000, in 1873 it was £650,000, and in 1876 it was £750,000. Had the undertakings of the Companies been transferred in 1856, at 20 years purchase, they would have cost £6,000,000; had they been purchased in 1866 they would have cost £10,000,000; in 1873 they would have cost £13,000,000; whereas in 1876 they would have cost £15,000,000. This showed the importance of dealing with the matter as soon as possible, and he trusted that no more delay than was absolutely necessary would take place. The growing tendency of the age was in favour of the administration of the water supply by the Local Authorities, and in upwards of 100 towns in the United Kingdom this state of things existed. He regretted, therefore as much as any one to have to withdraw these Bills, and he hoped that the Board, or some other authority, would take up the question again at an early date.

The CHAIRMAN said that as his name had been mentioned several times in the course of the discussion, he thought it only fair to himself to state to the Board what he had already stated in the Committee. He did not in any way shrink from any amount of labour and trouble in connection with the Bills entrusted to his care, if he thought there was the slightest chance of their success. But he was bound to tell the Board most frankly that he did not think there was the ghost of a chance of getting the Purchase Bill read a second time this session, on account of the forms of the House, which prohibited the bringing forward of a measure upon which there was any opposition after half-past twelve o'clock. As Mr. Roche remarked, the second reading of this Bill had been down six times, and that evening it was down for the seventh time, without the remotest chance of being brought on. Not only had he no help from the Government in the matter, on the contrary, he had reason to believe that they would oppose him; and even were it otherwise, the state of public business was such that he could not expect to carry the measure any further. He would go a step beyond, and say that, after listening to what the Solicitor had stated, he did not think the Board would be justified, even were the second reading assured for that night, in incurring the necessarily large expense of getting evidence and professional assistance to go before a Committee, unless they had a certain prospect of being able to pass the Bill through the House of Lords in time for it to become law this session. For all these reasons combined, he concurred with the majority of the Committee in thinking the Board ought at once to withdraw the Bills.

The motion for the adoption of the report was then put and carried *nem. con.*, and the Chairman was requested to withdraw both Bills.

#### THE WHITE ELEPHANT OF STOCKTON AND MIDDLESBROUGH.

On Thursday, May 2, a Special Meeting of the Middlesbrough Town Council was held—the MAYOR (Lieut.-Col. Sadler) in the chair—"for the purpose of considering a precept from the Stockton and Middlesbrough Water Board, requesting the payment of £400,000 on the 27th day of June next, to pass such resolutions thereon as may be deemed requisite, and to order the corporate common seal to be affixed to the orders and minutes of the meeting."

The TOWN CLERK laid before the Council the following report of a Committee of the Stockton and Middlesbrough Water Board, presented to the Board on the 29th of April:—

In compliance with the request of the Board, we beg to submit the following estimate of the total cost of the water-works.

The 15th section of the Act of 1876 directed that the sum of £18,647, the maximum dividend of the existing share capital of the Company, should be paid to the Company in perpetual annuities, or, at the Company's option, 25 years purchase on that amount. The Company having elected the latter alternative, this item will stand as £466,175 payable by the Water Board.

Under the provisions of the same section, Mr. Higgins has awarded £213,802 in respect of compulsory sale and prospective value. The statutory debts and debts *bonâ fide* incurred, which, by the 15th section, are also payable by the Board, have been ascertained by the Chairman and Mr. Belk to exceed £106,000. We will take them at £110,000, though it is not unlikely they may reach £120,000.

We have thus a total of £789,977, composed as follows:—

Twenty-five years purchase of statutory dividends	£466,175
Mr. Higgins's award	213,802
Statutory and other debts	110,000
	<b>£789,977</b>

The Water Board have expended the sum of £17,207, of which we attach a short analysis for the information of the Board.

The Corporation have a claim against the Board of £17,154, in respect of the Parliamentary expenses incurred in the session of 1876. Of this, £3114 is claimed by Corporation of Stockton, and £9040 by the Corporation of Middlesbrough.

There has been a suggestion that the sum paid by the Corporation of Middlesbrough for the expenses of the opposition to the Water Company's Bill in 1875 should be repaid. If this is acted upon, it would involve the payment to the Corporation of Stockton of the amount expended by that Corporation for the same purpose.

The expenses of the arbitration are not yet paid, except so far as they are included in the amount of £17,207, and set out in the analysis of this amount. It is impossible to arrive at any trustworthy estimate of this item.

Resuming the above figures, we have the following as the cost of the water-works, as far as ascertained at present:—

Amount payable under the 15th section of the Act	£789,977
Expended by the Board	17,207
Due to the Corporations for the Parliamentary expenses of 1876—	
Corporation of Stockton	£3114
Corporation of Middlesbrough	9040
	<b>17,154</b>

Unascertained—

The costs of the arbitration.	£—
The statutory debts and the debts <i>bonâ fide</i> incurred, so far as these exceed £110,000	£—

In any case the total cost can hardly be hoped to fall below £850,000.

The receipts of the Water Company for the year ending Dec. 31, 1877, were stated to have realized the sum of £41,106, excluding £202 profit on fittings, 1871 to 1877. The working expenses are set down as £11,217, leaving available for interest, &c., £29,849.

We have no reason to hope that, in the immediate future, the Board will be able materially to increase this amount except by altering the present scale of charges, which is lower than the parliamentary tariff, and by charging consumers outside the boroughs the full amount allowed by the statute, which is 25 per cent. above the charge to inhabitants of the boroughs. On the contrary, it is probable that the Water Company, for the purposes of the approaching arbitration, did all that lay in their power to increase the revenue of the undertaking in the period which elapsed from the passing of the Act of 1876 to the end of 1877. We will, however, assume that the revenue can be maintained at £29,849. If the Board borrows at 4 per cent. this sum will suffice to meet the interest on £746,225. But some provision should be made at once for the redemption of the moneys paid to the Water Company, and if we set this down at 8s. 9d. per cent., we are probably not far wrong, looking at the period over which the Board's power of redemption extends. In this case £29,849 would suffice to meet the interest and



redemption of £712,800. Even the larger of these amounts falls considerably short of the sum likely to be required by the Board, and does not even reach the amount for which precepts have been ordered to be issued.

It is not within our province to offer any suggestion to the Board as to the course which should be adopted under the circumstances. It will suffice if we point out that in the various estimates submitted to the respective Town Councils and Ratepayers it was assumed that a considerable surplus would remain after meeting all the claims for interest and redemption likely to arise against the water-works undertaking. The results of the arbitration have destroyed these hopes, and it will be for the Board to consider what steps should be taken under the altered conditions. The extraordinary depression under which the trade of the district is suffering, and which as yet shows no appearance of diminishing, cannot fail to be felt at the water-works in the shape of diminished demand for water, with an increasing proportion of uncollectable arrears.

On the motion for the adoption of the report,

Mr. BARRITT remarked that, according to this report, the Corporations were committed to an expenditure of £350,000 more than they had expected to obtain the works for. He asked the Town Clerk what would be the consequence if they now refused to complete the purchase.

The TOWN CLERK replied that the Corporations had nothing to do now except find the money; and if they did not find the money, the Water Board could find it, under the 56th section of the Act, independent of the Council. If the Water Board refused to complete the purchase, the Company could claim specific performance, and all the costs incurred would fall upon the Corporations.

Mr. GILL said he understood that the works had been offered for £550,000, which amount might have been reduced by £25,000. He wished to know who was responsible for refusing that offer.

Mr. HAMMOND suggested that the Corporations should offer the Water Company a lump sum to take back the works, and release them from their bargain.

Mr. ARCHIBALD asked what the actual cost would be before the new supply of water was taken from the Lune or the Balder, and what the Committee thought the rate per pound was likely to be.

The TOWN CLERK said, according to the Act, there were certain works which the Councils were bound to do within a limited time, but they could perhaps get an extension of time from Parliament.

Alderman TODD said he offered the Company £500,000 on behalf of the Corporations, but they asked £550,000, and he believed that £525,000 would have been accepted. It was, however, considered that if they gave that amount they would be giving £150,000 or £200,000 more than the works were worth.

Alderman BELL expressed regret that the Council did not go in for purchasing the works for £525,000 or £550,000. If they had done so, other gentlemen would have gone to the ratepayers and stated that they had given that amount for works in which the Company had only £250,000 as capital, and the cost in money expended only amounted to £336,000, and they would have been charged with giving £214,000 more for the works than they were worth.

The motion was then put and carried, and the Finance Committee were empowered to take the necessary steps to obtain the sum of £400,000 required by the precept of the Water Board.

On Friday, the 3rd inst., the report of the Water Board came before the quarterly meeting of the Stockton Corporation, when a long conversation ensued thereon.

The MAYOR, in moving the adoption of the report, said he could not congratulate the Council upon having obtained the works at a reasonable cost. He sincerely regretted that the members of the Board did not stand firm and take the responsibility of purchasing the works for £550,000. The reason they did not do so was that they were afraid the ratepayers would have said it was more than they were worth. Had they been there solely on their own responsibility, and as men of business, they would have closed the bargain at £550,000. As it was, there would be a deficiency of £1750 per annum to be made up annually by each town, which would cost a 3d. rate. The Board must also endeavour to remove the sewage of Barnard Castle from the river. The people using the water, it was said, were consuming the sewage of some 10,000 people in that town, which was a very unpleasant thing; and the sooner they removed it the better.

Mr. SETTLE asked if any calculation had been made as to what the 25 per cent. additional charge to outsiders would produce; also whether there could not be an appeal against the decision of the Arbitrator.

The MAYOR said he thought there could be no appeal.

Alderman NELSON remarked that, in order to meet the loss of £1750 per annum, the Council had two alternatives—either to raise the price of the water or to levy a rate, which, at the least, would amount to 3d. in the pound. So that they must begin with a rate of 3d. if they did not raise the price of the water.

Mr. GRAHAM said, if the Corporations had acted in a business-like way when they received an offer from the Company, they would have saved £300,000. They were now committed to an expenditure of something like a million and a half of money for what? To get pure water, and they would fail to get it. He never was in favour of the scheme, and if he lived 50 years longer he never would be satisfied with it. It simply meant additional rates. That was what it practically came to.

Alderman DODDS, M.P., made a long speech, in which he traced the progress of the negotiations. He expressed his confidence that, notwithstanding the high price paid by the Corporations, in a short time, like the gas-works, the water-works would be self-supporting. In the purchase of the gas-works they were blamed for allowing the 10 per cent. to the old Company, and were told it would not be a paying concern. This had turned out the reverse, and now they had better and cheaper gas, and were making a handsome profit from the sale. He believed the water scheme would eventually become a success to the Corporations, who would have the benefit and supply of good water at a cheap rate.

After some discussion, the motion was adopted.

HULL GAS SUPPLY.—Mr. James Baynes reports that during the past month the quality of the gas sent into the east district by the Sutton, Southcoats, and Drypool Gas Company was as follows:—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16.94	16.23	16.63
Grains of sulphur per 100 cubic feet	—	—	14.50
Grains of ammonia per 100 cubic feet	—	—	6.66
Mean barometer and temperature in experiment-room:—Barometer, 29.81; Temperature, 51.9°.			

TOTTEN GAS COMPANY.—The annual meeting was held on the 6th inst. The accounts showed a balance on the year of £621, out of which the Directors recommended the carrying of £100 to the reserve-fund, the payment of a dividend of 7½ per cent. (free of income-tax) amounting to £283, and the carrying forward of the balance of £238 to next year's account. In answer to an inquiry, the Chairman (Mr. Chester) said the Directors could not tender for the supply of the public lamps so long as the Town Council insisted upon the infliction of such heavy penalties as they had done. The Contractors for lighting the lamps with oil had not signed the contract, and consequently were not liable to these penalties.

# GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

The Ordinary General Meeting of the Shareholders of this Company was held at the London Offices, 80, Gracechurch Street, on Tuesday, the 7th inst.—Mr. T. HUGHES, Q.C. (Chairman of the Board of Directors), presiding.

The SECRETARY (Mr. Alfred Lass) having read the notice convening the meeting, the following report of the Directors was taken as read:—

The Directors have much pleasure in submitting to the Shareholders the accounts of the Company for the half year ending Dec. 31, 1877.

These, with the annexed report of the Engineer, to which the Directors beg to call the attention of the Shareholders, show the progress of the Company.

The Directors have to state that the profit for the half year has amounted to £1553 0s. 3d., which, with the balance brought from the last account, makes £1967 10s. 7d., and that after paying the interest on debentures, there remains an available balance of £1744 13s. 11d., out of which the Directors recommend the declaration of a dividend, for the half year ending the 31st of December last, on the preference share capital at the rate of 8 per cent. per annum, less income-tax, and on the ordinary share capital at the rate of 6 per cent. per annum, less income-tax, leaving a sum of about £700 to be carried forward to the next half year's account.

The Directors retiring by rotation are Quintin Hogg and Robert Pate Drysdale, who, being eligible, offer themselves for re-election. The retiring Auditor is James Waddell, who, being eligible, offers himself for re-election.

The dividend will be payable on and after the 1st of June next.

Engineer's Report.

Gas-Works, Georgetown, Feb. 25, 1878.

Gentlemen,—The half-yearly returns which have been forwarded will, I hope, be found correct; and the results of the half-year's working satisfactory. The several departments have been fully employed, and the demand for gas continues favourable. Coke and tar, show very promising results, the latter especially. There is still a market for the sale of ammoniacal liquor. The gas-fitting department has been satisfactorily employed. During the past six months 21 houses have been fitted with 362 lights and 76 additional lights, making a total of 438; to which may be added 8 public lamps. My monthly reports and returns keep the Board fully informed upon all matters. The whole of the works and machinery are in an efficient state of repair. In conclusion, I beg to congratulate the Directors on the price at which coals have been obtained during the past half year, and to thank them for their kind attention to our local requirements.

(Signed)

THOMAS B. YOUNGER, Engineer and Manager.

Dr.	Balance-Sheet, Dec. 31, 1877.	Cr.
Share capital—		
6200 shares, at £5 fully paid up . . . . .	£31,000 0 0	
Preference shares . . . . .	2,060 0 0	
Debenture bonds . . . . .	6,400 0 0	
Retort renewal-fund account . . . . .	19 6 2	
Bad debt fund . . . . .	110 15 0	
Bills payable . . . . .	261 14 9	
Amounts owing to sundry persons . . . . .	439 13 2	
Suspense account . . . . .	50 0 0	
Profit and loss account, net revenue . . . . .	1,744 13 11	
	£42,086 3 0	

Dr.	Revenue Account.	Cr.
Coals and bitumen . . . . .	£797 13 4½	
Purifying account . . . . .	26 4 10	
Wages account . . . . .	418 1 8½	
Repair and maintenance of works and plant, &c. . . . .	198 18 7½	
Salaries . . . . .	560 4 2	
Rent, rates, and taxes . . . . .	58 17 1	
Directors and Auditors fees . . . . .	135 5 0	
Trade and general charges . . . . .	146 18 9	
Bad debts and allowances . . . . .	22 7 5	
Law charges . . . . .	15 8 10	
	£2,399 19 9½	
Balance carried to profit and loss, net revenue . . . . .	1,553 0 3	
	£3,953 0 0½	

Dr.	Profit and Loss Account, Net Revenue.	Cr.
Dividend, &c., paid to shareholders to June 30, 1877 . . . . .	£857 8 0	
Interest on loans, debentures, &c., to Dec. 31, 1877 . . . . .	222 16 8	
Balance carried forward to next half year's account . . . . .	1,744 13 11	
	£2,824 18 7	

The CHAIRMAN then moved—"That the report and accounts as submitted to the Shareholders be received and adopted." In doing so he said: There is very little to be said on them. The Shareholders will have seen that the state of the works is quite satisfactory, and that all the products are fetching good prices in the colony; but there is one remark which I have to make on the balance-sheet, lest the Shareholders should carry away too favourable an idea of the condition and prospects of the Company, and should think that the Directors have not exercised a sound discretion in limiting the dividend for the present half year to 6 per cent. The fact upon which such an inference could be drawn is that the amount of profit appears to have very largely increased during the past half year. It stands at £1744, as against £1270 in the previous half, and £821 in the half year before that; but the fact is that the whole of that increase does not represent ordinary profit, or profit which can be safely relied on in the future. The truth is that the price of coals and freights has ruled very favourably for the Company during the past half year, and, therefore, the balance of profit stands in the present sheet larger than we could fairly suppose it would do in ordinary times, and when the business of the world was in a rather more satisfactory condition than it is at present. I should think it probable, especially in the matter of freights, that the next balance-sheet will show—the next half year's dealings will show—a considerable decrease from the amount at which they stand in the half year under review. I really do not know that there is anything further that I need call the Shareholders attention to. The capital account stands almost precisely in the position in which it has stood now for some time. The only additional expense is an outlay of about £500. That is in connection with new works which have been executed at Georgetown—works of a permanent kind. The little anxiety which I believe I had to report to the Shareholders as existing on the occasion of the last half yearly meeting, with regard to the foundation of the new gasholder, has passed away, and, in fact, as I said in my opening remarks, the state of the works and the state of affairs generally is quite of a satisfactory character. Under these circumstances, the Directors have recommended a dividend of 6 per cent. on the ordinary capital of the Company, which we consider as much as we could with prudence recommend to the Shareholders, and we hope that that view will be adopted by them. Of course the usual 8 per cent. will be paid on the preference share capital. The only other business, after declaring the dividend, will be to re-elect, if the Shareholders desire to do so, the retiring Directors. Mr. Quintin Hogg's position makes him an important person in this Company, and, though he is not able to give us much active help, or much attendance at meetings of the Board, yet his name and connection are certainly very valuable, and for the sake of our



business in the colony I think it very desirable that he should be re-elected, and he is prepared to offer himself for re-election, as is also Mr. Drysdale, who is the only local Director we now have.

Captain THURBURN, a Director, formally seconded the motion, which was carried unanimously.

The CHAIRMAN moved—"That a dividend for the half year ending the 31st of December last be declared on the preference shares, at the rate of 8 per cent. per annum, less income-tax, and on the ordinary shares at the rate of six per cent. per annum, less income-tax, and that the same be payable on the 1st of June next.

The motion having been seconded and carried, the retiring Directors and Auditor were re-elected.

Mr. MORRISON moved a vote of thanks to the Chairman and the Directors for their valuable services in connection with the Company. The Chairman, he said, had adopted almost an apologetic tone for paying a 6 per cent. dividend, but he (the speaker) thought they must congratulate themselves on it being a very handsome dividend. He hoped they would continue to derive benefit from low freights and the low price of coals; and when they resumed their normal position, he thought it probable that the extension of the Company's business would enable the Directors to give the Shareholders a larger dividend than they gave that day, with which, however, he was quite satisfied, as he believed his brother Shareholders were.

Mr. BLYTH, in seconding the motion, rather differed from Mr. Morrison, and thought that the Chairman was quite right in not "crowing too loudly."

The resolution was carried unanimously.

Mr. H. P. STEPHENSON (the Deputy-Chairman), in reply, said: On behalf of the Board, I beg to return our thanks for the vote which you have given us. I believe that we are in a fairly prosperous state—of course, dependent somewhat on the circumstances of the country. The Chairman will tell you that if the "jingos" have their way, freights will go up very much, and we are therefore looking very anxiously forward to what the "jingos" will do.

The proceedings then terminated.

### PARIS GAS COMPANY.

The Annual General Meeting of the above Company was held in Paris on the 28th of March, when the usual report of the Company's operations for the preceding year was presented by the Board of Direction. The report opens with a just tribute to the memory of the late esteemed President of the Company, M. Vincent du Bochet, whose death, on the 23rd of October last, was recorded, accompanied by a short biographical notice, in the JOURNAL of Nov. 13, 1877 (Vol. XXX., p. 758). It next announces the appointment of M. Frédéric Marguerite, who had acted as Vice-President of the Council since 1874, to the vacant post, and the selection of M. H. Sainte-Claire Deville, whose high scientific value is so well known, to fill the office of Vice-President. Coming then to the subject of the Company's operations, the report proceeds as follows:—

During the year 1877 the consumption of gas did not sensibly increase, but it would be an error to suppose that on that account our undertaking is no longer making progress. The real progress made in one year over the preceding is sometimes measured less by the augmentation of the consumption than by the increase in the number of consumers.

Consumption, which indicates pretty faithfully the position of affairs, is subject to temporary depressions, the effect of which we must take care not to exaggerate. What it is in the highest degree essential to prove is that our customers are increasing in numbers, and that the use of gas is becoming more general—passing more and more into the habits of the people; and in this respect the results obtained during the last few years are of such a nature as to give entire satisfaction. In fact, the increase in the number of our consumers in the three years from 1875 to 1877 amounted to 19,499; while during the two most favourable analogous periods since 1856—viz., from 1867 to 1869, and from 1872 to 1874—the increase did not exceed 14,705 in the former, and 16,193 in the latter.

It is therefore correct to say that the elements of consumption continue to multiply; that if, in 1877, they have not made themselves manifest by as great an increase in the amount of gas consumed as in 1876, they are none the less in existence, and when consumers return to their old habits an almost sudden increase in consumption will probably take place, to meet which it would be imprudent not to prepare ourselves.

These remarks were necessary in order that you might understand how indispensable it is that a fresh impulse should be given to our new works, although the quantity of gas sent out for consumption in the course of the year 1877 has not notably exceeded that of previous years.

#### GENERAL REVIEW OF THE COMPANY'S OPERATIONS.

*Consumption of Gas.*—During the year 1877 our works sent out for consumption a volume of gas equal to 191,197,228 cubic metres (6749½ million cubic feet), being 1,987,439 cubic metres (about 70 million cubic feet) more than in 1876.

The day consumption, which takes place between the time for extinguishing and the time for relighting the public lamps, figures in the above total to the extent of 42,473,616 cubic metres (1499 million cubic feet), and exceeds by 3,172,574 cubic metres (112 million cubic feet) the corresponding amount for the year 1876.

*Receipts for Gas.*—The receipts from the sale of gas amount to 48,205,805 frs. (£1,928,232). These receipts may be apportioned as follows between the three districts supplied by the Company:—

	Franks.	Sterling.
In Paris . . . . .	37,065,776	£1,482,631
In the environs . . . . .	8,009,515	320,380
In the outskirts beyond the fortifications . . . . .	3,130,514	125,221

Total . . . . . 48,205,805 . . £1,928,232

*Consumers.*—The number of consumers on the 31st of December last was 124,173, exceeding by 6388, or 5·42 per cent., the number at the same date in 1876. Of these 6388 new consumers, 4425, or more than 69 per cent., are supplied from the house services, while 1963 only, or 31 per cent., are supplied direct from the mains. This comparison shows to what extent these house services assist in the development of our business.

*Public Lighting.*—The number of public lamps in use on the 31st of December last was as follows:—

In Paris and its environs . . . . .	36,068
In the outskirts . . . . .	6,418

Total . . . . . 42,486

exceeding by 2306 the number in use on Dec. 31, 1876. During the year 1876 the increase amounted to only 773.

*House Services.\**—When required so to do, we continue the gratuitous laying on of service-pipes in houses where we calculate that the sale of gas will afford us a suitable return for our outlay. Contrary to what has hitherto been the case, the number of services annually laid on to in-

habited houses is considerably in excess of those laid on to entirely new houses.

Out of 100 house services, 87 were applied for by lodgers who intended using gas at once, and, whose consumption assured us an immediate return, for which, in the case of services laid on to new houses, we have sometimes to wait. At all events, the results obtained have more than realized the hopes we entertained respecting these additional services.

Let us leave the figures to speak for themselves. During the year 1877 we laid on 1293 house services—165 on the application of landlords, who undertook, at their own expense, to fit up a minimum of three burners in three apartments, and 1128 on the application of lodgers, who were ready to contract at once for a supply to at least the same number of burners. The number of these services, which on Dec. 31, 1873, was 5362, has doubled in four years, and on Dec. 31, 1877, had reached 10,540, distributed over 8746 houses. Now, it is estimated that there are 70,000 houses in Paris; it may therefore be judged, by a comparison of these figures, what an extensive field is still open for development.

These 10,540 house services, exclusive of branch-pipes, taps, and meters, which are subject to a special payment, cost 6,164,470 frs. (£246,579), which corresponds to an average cost of 585 frs. (£23 8s.) per service, being rather over the average of 583 frs. stated on Dec. 31, 1876, and exactly the same as that for the year 1875.

The receipts arising from the sale of gas supplied to these services in 1877 amounted to 6,183,991 frs. (£247,359), showing an increase of 794,622 frs. (£31,785), or 14 per cent., on the analogous receipts for the preceding year, which amounted to 5,389,372 frs. (£215,575).

With regard to the number of consumers supplied from the house services, on Dec. 31, 1877, it had reached 81,230, exceeding by 4425 the number at the corresponding date in 1876. During that year the number had increased by 4325.

These figures show that the use of these house services is progressing, that their utility is becoming more and more established, and that the Company obtain for the capital expended thereon a return which justifies the extension they have for some few years past given to this branch of their operations.

*Principal Results of Working.*—The following table, giving the results of the first 22 years working of the Company, shows that during that period the increase in the consumption of gas has amounted to 150,422,828 cubic metres (about 5310 million cubic feet), or 369 per cent.; the average annual increase, excluding the years 1870 and 1871, having been 7,520,000 cubic metres (about 265½ million cubic feet) in round numbers. In the past three years this annual average has been much higher, having reached 10,181,700 cubic metres (nearly 359½ million cubic feet):—

Year.	Annual Consumption. Cubic Metres. (1 c. m. = 35·317 c. ft.)	Annual Increase. Cubic Metres. (1 c. m. = 35·317 c. ft.)	Annual Dividends. Franks.
1855 . . .	40,774,400	—	—
1856 . . .	47,335,475	6,561,075	40·00
1857 . . .	56,042,640	8,707,165	45·00
1858 . . .	62,159,300	6,116,660	50·00
1859 . . .	67,628,116	5,468,816	60·00
1860 . . .	75,518,922	7,890,806	70·00
1861 . . .	84,230,676	8,711,754	70·00
1862 . . .	93,076,220	8,845,544	85·00
1863 . . .	100,833,258	7,757,038	95·00
1864 . . .	109,610,003	8,776,745	105·00
1865 . . .	116,171,727	6,561,724	105·00
1866 . . .	122,334,605	6,162,878	110·00
1867 . . .	136,569,762	14,235,157	115·00
1868 . . .	138,797,811	2,228,049	120·00
1869 . . .	145,199,424	6,401,613	102·00
1870 . . .	114,476,909	30,722,520 dec.	40·50
1871 . . .	87,481,346	26,995,558	32·50
1872 . . .	147,668,331	60,186,985	51·00
1873 . . .	154,397,118	6,728,787	52·50
1874 . . .	160,652,202	6,255,084	55·00
1875 . . .	175,938,244	15,286,042	60·00
1876 . . .	189,209,789	13,271,545	62·00
1877 . . .	191,197,228	1,987,439	62·00

*Manufacturing Power.*—The manufacturing power of our works, which on Dec. 31, 1876, was 210,375,000 cubic metres (7426½ million cubic feet), including that of the reserve plant destined to meet cases of accident, or any unexpected increase in consumption, was raised, in the course of the year 1877 to 228,500,000 cubic metres (8066 million cubic feet), in the prospect of an augmentation of consumption equal to that of the two preceding years.

We estimate that at the end of the current year, upon the completion of the works in progress at the various stations, our manufacturing power will be equal to 236 million cubic metres (8331 million cubic feet), and be capable of sending out for consumption, deducting reserve, 213 million cubic metres (7519 million cubic feet), thus giving every security for next winter's supply.

*Canalisation.*—During the past year our mains have been extended by 55,007 metres, apportioned as follows:—

	Metres.	Yards.
In Paris and its environs . . . . .	25,382	27,751
In the outskirts . . . . .	29,625	32,390
Total . . . . .	55,007	60,141

Or about 34 miles. We have also increased the diameter of our mains over a total length of 2425 metres (2651 yards). Consequently, the total length of mains laid under the public roadways has been increased from 1,704,245 metres to 1,759,252 metres, apportioned as follows:—

	Metres.	Yards.
In Paris and its environs . . . . .	1,252,312	1,369,194
In the outskirts . . . . .	506,940	554,254
Total . . . . .	1,759,252	1,923,448

Or nearly 1100 miles. As usual, the greater portion of the main-laying work was done either at the request of the Municipal Authorities, or in the performance of our contracts with the various communes; the remainder was undertaken by the Company with the view of meeting certain demands of private lighting which appeared advantageous.

We have recently negotiated with the commune of Ville-d'Avray a lighting contract, which is now awaiting the approval of the *Administration Supérieure*. The conditions of this contract are exactly the same as those contained in contracts already entered into with many other communes, and like them will expire with our concession on Dec. 31, 1905. When this contract comes into operation, the number of communes lighted by the Company, in the departments of the Seine and Seine-et-Oise, will be fifty-one.

[The report then refers to the settlement in the Company's favour of certain long-standing difficulties between them and the communes of Neuilly and St. Mandé relative to the payment of *octroi* duties on the coals consumed at the Company's stations in those communes, to which, under the Company's treaty of 1857, the Communal Authorities claimed to

\* These house services, called *conduites montantes*, are pipes carried from the bottom to the top of the building, for the supply of flats and separate apartments, as in Scotland.



be entitled, although the ground on which the works stand has since 1859 formed part of the City of Paris. The case was heard first by the Conseil de Préfecture, who decided in the Company's favour, and this decision was subsequently confirmed by the Conseil d'Etat.]

EXPENSES OF FIRST ESTABLISHMENT.

You are aware that these expenses are incurred, on the one hand, with the object of extending our mains and services—that is to say, doing whatever may contribute to the progress of the Company—and, on the other, the carrying out, at our various stations, of the necessary works for rendering our manufacturing power equal to the requirements of the consumption. The fact of being compelled each year to sink fresh capital in extensions is a proof of the daily growth of our Company, and when this ceases to be the case we shall have attained the limit of our progress.

Do not alarm yourselves, however. Our industry is in the plenitude of its development; its domain is continually extending. Gas presents advantages that are quite its own; it may be employed equally well for lighting, for heating, and for the production of motive power; and all the inventions having for their object the substitution of painfully brilliant lights, of complicated installation, for the soft, easily managed, and indefinitely divisible light of gas, will in no way diminish the constantly increasing number of our consumers.

During the year 1877, we, in a great measure, finished the works in progress at our stations at La Villette and Ivry, where the productive power has been considerably augmented; we are, therefore, in a position to devote the whole of our care and attention to the new works at Clichy, of which the foundations have just been laid. These works will cover an area of 17 hectares (42 acres), and will be equal to an annual production of 75 million cubic mètres (2647 million cubic feet). We intend constructing these works in portions, and gradually developing them in proportion to the requirements of consumption, and we shall, of course, introduce all the improvements which have been proved by long experience to be suitable and efficacious.

The total amount expended on works of first establishment during the year 1877 was 7,836,057 frs. (£313,442), apportioned as follows:—

ACCOUNT OF EXPENSES OF FIRST ESTABLISHMENT FOR THE YEAR 1877.  
Expended in the Purchase of Land, &c.

	Francs.	Sterling.
Land acquired for the extension of coal stores at La Villette . . . . .	125,025 . .	£5,001
Plot of ground at Ivry . . . . .	9,815 . .	392
Property acquired for the extension of the coke store at Ivry . . . . .	54,759 . .	2,190
Land acquired for the construction of a branch line between the St. Mandé station and the Ceinture Railway . . . . .	17,500 . .	700
Property acquired for do. . . . .	31,300 . .	1,252
Sundry plots of ground acquired for enlarging the coal and coke yards at Boulogne (Paris) . . . . .	32,400 . .	1,296
Legal and other expenses in connection with above . . . . .	75,285 . .	3,012
	346,084 . .	£13,843
Less value of land at La Villette, transferred to the Chemin de Fer de l'Est . . . . .	249,611 . .	9,984
Total . . . . .	96,473 . .	£3,859

Expended on Works and Plant.

<b>La Villette.</b> —Completion of three gasholders, each of 15,000 cubic mètres (530,000 cubic feet) capacity; do. of two gasholder-tanks; inlet and outlet mains; completion of two settings of eight through retorts, begun in 1876; battery condensers; new 20-horse power engine for working the pumps . . . . .	1,570,098 . .	£62,804
<b>Les Ternes.</b> —Completion of gasholder of 20,000 cubic mètres (706,000 cubic feet) capacity; new valve-house and water reservoir; completion of pipe condenser . . . . .	193,370 . .	5,335
<b>Passy.</b> —Completion of telescopic gasholder of 8500 cubic mètres (300,000 cubic feet) capacity . . . . .	51,941 . .	2,077
<b>Vaugirard.</b> —Enlargement of coke-crusher; completion of gasholder of 15,000 cubic mètres capacity; additional station-meter; extension of horizontal condensers . . . . .	100,182 . .	4,007
<b>Ivry.</b> —Completion of two gasholders, each of 20,000 cubic mètres capacity; do. of four settings of eight through retorts, with Siemens's generators; erection of two additional retort-settings, similar to preceding; three exhausters, with governor; three steam-boilers, each of 22-horse power; four station-meters, capable of passing 40,000 cubic mètres (1,412,000 cubic feet) per 24 hours; tar-wells and well borings; purifying-house, containing 24 purifiers; coke-crusher; completion of stable for 90 horses; consolidation of subsoil and foundations . . . . .	2,117,769 . .	84,711
<b>Belleville.</b> —Conversion of two ordinary retort-settings into Siemens's ovens; new station-meter capable of passing 300,000 cubic mètres (1,000,000 cubic feet) in 24 hours . . . . .	31,320 . .	1,253
<b>St. Mandé.</b> —Completion of a second coke-crusher and two sets of ten purifiers, with revivifying sheds; paving work . . . . .	129,841 . .	5,194
<b>Boulogne.</b> —Completion of pipe condenser; gas-engine for working coke-crusher; station-meter; battery condenser . . . . .	33,952 . .	1,358
<b>Maisons-Alfort.</b> —Raising level of yards; heightening a setting of three through retorts; gas-engine for working tar and liquor pumps . . . . .	82,845 . .	1,314
<b>Clichy.</b> —Banking up soil of works; boundary and other walls; cranes and lines of rails for the transport and discharge of material; excavations for three gasholder-tanks . . . . .	537,623 . .	21,505
<b>Tar-Works at La Villette.</b> —Setting of six new coppers for the distillation of tar; two steam generators, and a pitch machine . . . . .	66,819 . .	2,673
<b>Works for the Treatment of Chemical Products.</b> —Two apparatus for the distillation of ammoniacal liquor; sheds for stacking sulphate of ammonia casks; pump and reservoir . . . . .	78,234 . .	3,129
<b>Sundry works at the other stations of the Company . . . . .</b>	62,594 . .	2,504
<b>Total . . . . .</b>	4,946,608 . .	£197,864

Expended on Mains, Services, Fittings, &c.

	Francs.	Sterling.
<b>Main-laying.</b> —New mains laid during the year, and replacing old mains by others of larger diameter . . . . .	1,096,657 . .	£43,866
<b>House Services.</b> —Expenses of laying on, including premiums . . . . .	769,503 . .	30,780
<b>Branch-pipes and Fittings.</b> —Construction of fittings, &c., let out on hire during the year 1877 . . . . .	337,527 . .	13,501
<b>Meters.</b> —Purchase of meters let out on hire . . . . .	304,898 . .	12,196
<b>Vehicles.</b> —Increase in the number of horses and vehicles for the conveyance of coal, coke, tar, ammoniacal liquor, &c. . . . .	119,700 . .	4,788
<b>Tools and Material.</b> —General increase in stock . . . . .	50,929 . .	2,037
<b>Establishment Expenses.</b> —Miscellaneous payments . . . . .	113,762 . .	4,551
<b>Total . . . . .</b>	2,792,976 . .	£111,719

Total expenses of first establishment 7,836,057 . . £313,442

The general position of the account of expenses of first establishment may be thus stated:—

	Francs.	Sterling.
Amount expended to Dec. 31, 1876 . . . . .	162,024,390 . .	£6,480,975
Ditto during 1877 . . . . .	7,836,057 . .	313,442
<b>Total on Dec. 31, 1877 . . . . .</b>	169,860,447 . .	£6,794,417
To meet which there is a capital of—		
In shares . . . . .	84,000,000 frs.	
In bonds . . . . .	85,145,739 frs.	
	169,145,739* . .	£6,765,829
<b>Balance against the Company . . . . .</b>	714,708 . .	£28,588

**Loan of 1875.**—The loan of 25,226,080 frs. (£1,009,044), which you authorized us to contract in 1875, in order to liquidate the expenses of first establishment incurred up to Dec. 31, 1874, and to raise the annual manufacturing power of our works by 40 million cubic mètres (1412 million cubic feet), has been appropriated, for works carried out during the year 1875 and following years, to the extent of 23,216,000 frs., apportioned as follows:—

	Francs.	Sterling.
Purchase of land and extension of works . . . . .	13,316,000 . .	£532,640
Main-laying . . . . .	3,260,000 . .	130,400
House services, fittings, and meters on hire, tools, &c. . . . .	6,640,000 . .	265,600
<b>Total . . . . .</b>	23,216,000 . .	£928,640
The amount expended out of this sum during the years 1875, 1876, and 1877 reached a total of 23,930,708 frs., apportioned as follows:—		
	Francs.	Sterling.
Purchase of land and extension of works . . . . .	13,970,199 . .	£558,808
Main-laying . . . . .	3,533,755 . .	141,350
House services, fittings, and meters on hire, tools, &c. . . . .	6,426,754 . .	257,070
<b>Total . . . . .</b>	23,930,708 . .	£957,228

The expenses incurred have, therefore, exceeded the estimated expenses by 714,708 frs. (£28,588). This excess is due principally to the purchases of land, of which we gave you the particulars at our last meeting, and which we were able to effect under exceptionally advantageous circumstances. We shall now be enabled to increase the works at Clichy by one-half more than we originally intended, double the power of the tar-works at La Villette, and secure the coke service at Vaugirard and Ivry. These acquisitions not being included among the works for the execution of which the loan of 1875 was raised, are less an augmentation of the estimated expenses than a useful and necessary addition to them, and the outlay thus incurred will lessen by so much the amount to be raised by future loans.

We need not add that these purchases have not in any way prejudiced the works specially provided for by the loan of 1875. In fact, owing to the economy exercised in carrying out those works, our manufacturing power exceeds by 3½ million cubic mètres (123½ million cubic feet), the figure to which, by the aid of this loan, we were to be enabled to raise it.

This year, as in 1875 and 1876, the total of our expenses of first establishment exceeds the amount of our realized resources. This circumstance has not, however, appeared to us to necessitate any alteration in the conditions of payment of the current loan; on the contrary, we have thought it advisable not to call up, in anticipation, money on which 5 per cent. would have to be paid, when we had capital in hand that would be liable to only a very trifling interest.

WORKING ACCOUNT FOR THE YEAR 1877.  
EXPENDITURE.

	Francs.	Sterling.
Value of gas in store on Jan. 1, 1877 . . . . .	26,642 . .	£1,065
<b>Materials used in Manufacture.</b>		
Coals carbonized . . . . .	17,042,696 . .	£681,708
Coke and tar for heating purposes . . . . .	3,316,402 . .	132,556
	20,359,098 . .	£814,364
<b>Manufacturing Charges.</b>		
Salaries and wages . . . . .	2,312,749 . .	£92,510
Maintenance of works and plant . . . . .	1,490,595 . .	59,624
Incidental expenses of distillation . . . . .	1,038,174 . .	41,527
Purifying material . . . . .	268,968 . .	10,759
General expenses . . . . .	71,294 . .	2,852
	5,181,780 . .	£207,272
<b>Cost of Distribution.</b>		
Salaries of Engineers and Officers . . . . .	999,642 . .	£39,986
Repair and maintenance of mains and service-pipes . . . . .	501,430 . .	20,057
Allowances, premiums, &c. . . . .	11,764 . .	470
Printing and advertising . . . . .	117,276 . .	4,691
Miscellaneous . . . . .	50,416 . .	2,017
	1,680,528 . .	£67,221

\* It follows from an examination of the balance-sheet that out of a capital of 169,145,739 frs. there had been paid off, on Dec. 31 last, in shares 6,716,500 frs.; in bonds, 7,226,142 frs.; total, 13,942,642 frs.; leaving 155,203,097 frs. still to be redeemed.



<i>General Management.</i>		Francs.	Sterling.
Board of Direction . . . . .		80,000	£3,200
Executive Committee . . . . .		70,000	2,800
Salaries . . . . .		715,051	28,602
Office and other expenses . . . . .		134,313	5,373
Service, accidents, relief, &c. . . . .		144,875	5,775
Law and other charges . . . . .		12,988	519
Rents and insurances . . . . .		76,232	3,049
Interest on loans . . . . .		4,514,307	180,572
Loan redemption-fund . . . . .		1,100,000	44,000
Share ditto . . . . .		1,260,250	50,410
Cost of experiments, &c. . . . .		26,953	1,078
Pension-fund . . . . .		85,500	3,420
Provident-fund . . . . .		102,767	4,111
		8,322,736	£332,909
<i>Municipal Charges.</i>			
Tax of '02 c. per cubic metre of gas . . . . .		3,309,478	£132,379
Rating of subsoil . . . . .		200,000	8,000
Lighting, extinguishing, and maintenance of public lamps . . . . .		457,735	18,309
		3,967,213	£158,688
<i>State Charges.</i>			
Taxes . . . . .		421,700	£16,868
Stamps . . . . .		108,870	4,355
Subsidy to Control Department . . . . .		8,000	320
		538,570	£21,543
<b>Total Expenditure.</b> . . . .		<b>40,076,567</b>	<b>£1,603,062</b>
<i>REVENUE.</i>			
Produce of the sale of gas . . . . .		48,205,806	£1,928,232
Value of gas in store on Jan. 1, 1877 . . . . .		25,925	1,037
Retort coke . . . . .		14,253,555	570,142
Furnace coke . . . . .		547,948	21,918
Tar . . . . .		2,024,064	80,963
Ammoniacal liquor . . . . .		313,206	12,528
Rent of meters on hire . . . . .		1,031,029	41,241
Ditto of fittings, &c., ditto . . . . .		1,020,677	40,827
Fire-bricks . . . . .		245,600	9,824
Chemical products . . . . .		961,046	38,442
Sundry works . . . . .		114,168	4,567
Interests and discounts . . . . .		360,760	14,430
<b>Total Revenue</b> . . . . .		<b>69,103,784</b>	<b>£2,764,151</b>
Balance in favour of revenue, being profit made during 1877 . . . . .		29,027,217	£1,161,088
Add balance of profit from 1876 . . . . .		130,149	5,206
		29,157,366	£1,166,294
Deduct reserve to meet claims outstanding on Dec. 31, 1877 . . . . .		57,366	2,294
Balance, being profit available for distribution . . . . .		29,100,000	£1,164,000
Deduct for share dividend . . . . .		12,400,000	496,000
Balance divisible equally between the Municipality of Paris and the Gas Company . . . . .		16,700,000	668,000
The total amount available for distribution among the Shareholders is: therefore, as follows:—			
	Francs.	Sterling.	
Dividend, as per above account . . . . .	12,400,000	£496,000	
Moiety of balance, ditto . . . . .	8,350,000	334,000	
Fifth payment by the Municipality of Paris . . . . .	50,000	2,000	
Balance of profit from 1876 . . . . .	193,824	7,752	
<b>Total</b> . . . . .	<b>20,993,824</b>	<b>£839,752</b>	
Deduct 1 fr. per share for special reserve-fund, authorized at the general meeting on March 23, 1875. . . . .	336,000	13,440	
Balance . . . . .	20,657,824	£826,312	
Deduct first dividend of 12 frs. 50 c. paid in October last . . . . .	3,927,187	157,087	
	16,730,637	£669,225	
Deduct final dividend of 49 frs. 50 c., making a total dividend for the year of 62 frs. per share (250 frs.) . . . . .	16,632,000	665,280	
<b>Net balance to carry forward</b> . . . . .	<b>98,637</b>	<b>£3,945</b>	

## PROVIDENT AND OTHER FUNDS.

*Provident-Fund.*—During the year 1877 the medical staff visited, at their homes, 1317 of the Company's servants, and attended 21,526 consultations. The medical fees, medicine, baths and instruments, half salaries to the workmen and other servants of the Company who are unable to discharge their duties on account of sickness, and funeral expenses, caused an expenditure of 210,640 frs. The account of this fund stands as follows:—

<i>Expenditure.</i>		Francs.	Sterling.
Medical fees, medicine, &c., as above . . . . .		210,640	£8,425
<i>Receipts.</i>			
One per cent. deducted from salaries, &c. . . . .		102,769	£4,110
Equal amount given by the Company . . . . .		102,769	4,110
Interest and sundry receipts . . . . .		9,752	390
<b>Total</b> . . . . .		<b>215,290</b>	<b>£8,611</b>
Excess of receipts . . . . .		4,650	£186

In the preceding year, on the contrary, the expenses exceeded the receipts by 25,129 frs. (£1005).

On the 31st of December last this fund possessed 157 of the Company's fully-paid bonds; the Company were, however, at the same time, indebted to the fund in a sum of 46,488 frs. (£1859), which reduced the balance to its credit to 38,320 frs. (£1532). At the corresponding date in 1876 this credit balance stood at 23,670 frs. (£1147).

*Pension-Fund.*—The amount set apart for this fund, which, by your decision of March 23, 1875, was raised from 25,500 frs. to 85,500 frs. (£1020

to £3420), has been further augmented this year by the sum of 100,000 frs. (£4000), for which we are indebted to the generosity of the heirs of the late M. Du Bochet.

The amount placed to the credit of the fund since its formation, including interest and balance realized upon the last drawing of bonds, reached on Dec. 31, 1877, a total of 1,589,691 frs., represented by—

	Francs.	Sterling.
Bonds partly paid up (3131) . . . . .	1,367,443	£54,637
Balance in hand . . . . .	222,248	8,990
<b>Total</b> . . . . .	<b>1,589,691</b>	<b>£63,567</b>

The disposable balance, augmented by the grant made to the fund for the first quarter of the year 1878, will be employed in paying off the fourth instalment on 1368 bonds not fully paid up, and in the purchase of fresh securities. Supposing that these can be purchased at about par, it will be seen that the revenue of the pension-fund will, at the end of the year, amount to about 80,000 frs. (£3200), after deducting tax.

The deduction of 4500 frs. made each year from the amount placed to the credit of this fund, in conformity with the rule, for the purpose of assisting those of the Company's servants who have become incapable of performing their duties, but who have no claim upon the fund, has not been sufficient. We have, therefore, had to subsidize it to the extent of 62,488 frs. (£2499), forming a total of 66,988 frs. (£2678), of which 15,588 frs. (£623) are for pensions, and 51,399 frs. (£2055) are for assistance, renewable every year. Last year this subsidy amounted to 56,502 frs. (£2260).

*Savings-Fund.*—This fund, as you are aware, is of recent origin; it dates from the 1st of July, 1876. Our object in establishing it was to inspire habits of thriftiness in our workmen and servants, and afford them facilities for putting away, without expense or loss of time, whatever money they might be able to save each month out of their earnings. The deposits are entered in a small book in the name of the depositor, and bear interest at the rate of 5 per cent. per annum. When the sums deposited amount to 500 frs., the Company undertake, with the depositor's consent, and free of charge, to invest the same in their own bonds, or in railway or other stocks, for which vouchers are given to such depositor. The operations of this fund may be summarized as follows:—

Since July 1, 1876, there have been 2705 accounts opened, the amount received on deposit having been

	Francs.	Sterling.
Out of this sum there has been repaid—		
In cash to 969 depositors, 352 of whom have left the Company's service . . . . .	74,511	frs.
In vouchers to 88 depositors whose deposits exceeded 500 frs. . . . .	41,504	frs.
	116,015	£4,640

Balance in hand on Dec. 31, 1877 . . . . . 206,170 . . £8,247

Adding this sum to the amount of the vouchers delivered, we obtain a total of 247,674 frs. (£9907), which represents the amount saved by the Company's servants in the course of 18 months.

*Special Reserve-Fund.*—This fund, which was instituted in conformity with Article 40 of the Statutes, is augmented each year by means of a levy of one franc per share upon the Shareholders profits, to which is added the annuity of 210,296 frs. (£8412) due to the Company by the Municipality of Paris, in execution of Article 4 of the treaty of April 27, 1872. The position of this fund on Dec. 31 last was as follows:—

	Francs.	Sterling.
Amount paid into fund . . . . .	1,344,000	£53,760
Interest . . . . .	123,064	4,922
Deferred annuities of the City of Paris, capital and interest . . . . .	1,162,570	46,502
<b>Total</b> . . . . .	<b>2,629,634</b>	<b>£105,184</b>

The first two amounts are represented by 3176 of the Company's bonds, paid up to the extent of 400 frs., having cost 1,149,242 frs. (£45,969), and by a balance in hand of 317,822 frs. (£12,713), which will be applied in paying off the fourth instalment on these bonds, due on the 6th of April.

## LABOUR, MATERIALS, RESIDUALS, ETC.

*Labour.*—During the year 1877 the price of labour remained stationary. Owing to our having, in 1876, granted an increased rate of pay, and certain other privileges, to our workmen and servants, we experience no difficulty in filling up any vacancies that may occur, and we have only had to congratulate ourselves on the order and discipline that have constantly prevailed at our several stations.

*Coal.*—Several coal contracts entered into in 1872, when prices were high, expired last year. We informed you at our last meeting that we had renewed these contracts on favourable conditions, and we shall therefore be able to count upon a considerable improvement under this head in the course of the present year, if coke, of which the price is regulated by that of coal, does not sustain a nearly equivalent depreciation.

*Retort Coke.*—Although in the year 1877 we produced only 38,547 hectolitres (2965 chaldrons of 36 bushels) of coke more than in 1876, our stock on the 31st of December last exceeded by 1,726,428 hectolitres (182,802 chaldrons) that on the same date in the preceding year. This falling off in the sale of coke is the very natural consequence of the exceptional mildness of the past two winters. It in no way implies the abandonment of this combustible for industrial and domestic purposes, as, during a few cold days in the month of January, 1878, our coke sales exceeded the production by more than 100,000 hectolitres (7692 chaldrons). We estimate that two ordinary winters will suffice to enable us to clear off this superabundance of coke.

The produce from the sale of coke, which in 1876 reached 14,999,028 frs. (£599,961), amounted to only 14,253,555 frs. (£570,142), showing a diminution of 745,473 frs. (£29,819), or very nearly equal to the amount saved on the coal.

This result furnishes us with a fresh example of the compensatory part played by coke in our industry, in mitigating to a very considerable extent the effects of fluctuations in the price of coal.

With regard to the produce of the manufacture of metallurgical coke, this produced 547,947 frs. (£21,917), exceeding by 15,939 frs. (£637) the amount realized in the preceding year.

*Heating Apparatus.*—In the course of the year 1877 we sold 1471 apparatus for heating by coke, being 810 less than in 1876; this brings the number of apparatus sent out from our works up to 44,523, the whole of which are now, so to speak, in operation in Paris.

*Tar and Chemical Products.*—The quantity of tar and ammoniacal liquor produced at the various stations of the Company now exceeds 100,000 tons per annum. We continue to bestow a considerable amount of care on the treatment of these secondary products, which it would be impossible to sell directly, and which we work up into a certain number of commercial products suitable to various requirements. The net produce of this manufacture in 1876 was as follows:—



	Francs.	Sterling.
Treatment of tar . . . . .	2,567,901	£102,716
Treatment of ammoniacal liquor . . . . .	930,008	37,200
Total . . . . .	3,497,909	£139,916
Last year the figures were—		
	Francs.	Sterling.
Treatment of tar . . . . .	2,024,064	£80,962
Treatment of ammoniacal liquor . . . . .	961,046	38,442
Total . . . . .	2,985,110	£119,404

Showing a decrease of 512,799 frs. (£20,512). This diminution of profit is solely due to the depreciation of one of the products of the distillation of tar—viz., anthracene, which is employed in the manufacture of artificial alizarine. The principal markets for this latter product are in the East, where it is used for dyeing purposes; but there is now no sale for it. Events have disturbed the equilibrium that existed between the production and the consumption, and the glutted state of the market has been quickly followed by a fall of 70 per cent. in the selling price. However, all our production for the next two years is sold, and on relatively advantageous conditions.

**Gas-Engines.**—The use of these engines in minor industrial operations continues to extend. During the year 1877 we sold five horizontal engines on Lenoir's system, and 37 of Otto and Langen's vertical engines; making a total number of 769 engines on both systems that have left our works in the course of 15 years. The number of gas-engines in operation in Paris on the 31st of December last was 257, of which 129 were horizontal, and 128 vertical, representing altogether a motive power equal to 340 horses. It is estimated that the quantity of gas consumed by these machines during the past year was 897,000 cubic metres (31,664,000 cubic feet).

We are at present engaged on the construction of a new gas-engine, recently invented by M. Otto, which seems to solve more satisfactorily than its predecessors have done, the problem of the application of gas to the production of motive power.

#### NEW LOAN.

The report concludes by stating that, owing to the unexpected increase in the consumption of gas during the past three years, the Directors anticipate that the limit of the productive power of their works will be attained somewhat earlier than they contemplated at the time the loan of 1875 was raised. They estimate that in the year 1881 the consumption of gas will be about 240 million cubic metres (8472 million cubic feet) per annum, and, in order to be prepared to meet this great demand upon their resources, the manufacturing power of the several stations, including the plant in reserve, should be raised, in the course of the forthcoming four years, to 261 million cubic metres (9213 million cubic feet), or 32½ million cubic metres (1147½ million cubic feet) in excess of the power attained on the 31st of December last.

The total amount required for carrying out these extensions, as well as for proportionately increasing the mains, house services, number of meters, &c., is estimated at 26,600,000 frs. (£1,064,000). This sum the Directors propose to raise by the issue of 56,000 bonds of 500 frs., repayable at par, by means of a sinking-fund, in 25 yearly payments, from Jan. 1, 1882, to the end of the Company's concession on Dec. 31, 1905. These bonds will be issued at 475 frs., payable in four instalments, and half-yearly coupons will be attached, bearing interest ranging from 12 frs. 50 c. to 25 frs. per annum. The bonds will be offered exclusively to Shareholders in the Company, and will be allotted in proportion to the number of shares held.

#### GAS AFFAIRS AT READING.

At the Quarterly Meeting of the Reading Town Council, on Thursday, May 2—the MAYOR (Mr. J. Silver) presiding—the following report of the Gas Committee was submitted:—

In consequence of the resolution passed at the Council on the 4th of April, on the subject of the arrangements for testing the purity of the gas, this Committee, at a meeting on the 23rd ult., considered the matter, and resolved—“That in the opinion of the Committee it is not possible to make satisfactory arrangements for the testing of the illuminating power of the gas by the Borough Analyst until this work can be performed in the Analyst's laboratory in the municipal buildings, and that the Committee do therefore recommend to the Council that the resolutions adopted by the Committee at their last meeting on the subject of the purity of the gas be approved, adopted, and confirmed by the Council.”

The Gas Inspector (Mr. B. F. Hart) reported that the public lamps were in a satisfactory condition. He had sent a list of 294 lamps to the Gas Company which might be stopped off for the summer, leaving 406 to light, and 56 extra summer lamps to be charged for. New lamps would be required in Mundesley Street, Essex Street, Whitley, and in another new street on the Redlands Estate. He had tested the illuminating power of the gas four times during the month, with the following results:—March 23, 12·71; April 3, 13·33; April 9, 13·46; April 17, 13·45; the minimum standard being 12 sperm candles.

Alderman HEWETT, in moving the adoption of the report, said it was something rather novel now for the gas question to take up their time, though some years ago it was one of the most exciting subjects they had. About 1863 an alteration was made by the introduction of meters, which were tried for about five years; they involved a great deal of trouble, and the results were not satisfactory. Since then they had gone on very comfortably, and there had been no complaint; the Company had carried out their contract, and he considered they had a very able and efficient officer in Mr. Hart. The Committee, when they met the other day, did not consider that the Corporation would gain anything whatever by the alteration suggested at the last Council as to testing the illuminating power of the gas. As Dr. Shea could not do that testing at his own laboratory, they proposed that their previous resolution should now be confirmed. Dr. Shea offered to test the purity of the gas periodically, and the Committee were sure it would be well done.

Mr. HOUNSLOW seconded the motion.

Mr. KING wished to move as an amendment—“That no arrangement for testing the gas can be satisfactory that does not combine the test for purity with that for illuminating power, and that the duty would be best performed by the Borough Analyst; and that to secure due economy the general superintendence of the lighting be placed under the Borough Surveyor.” He said he had made inquiry, and was unable to find any town in England with similar arrangements. In all the towns from which he had heard, testing for illuminating power and superintending the public lighting were performed by the Borough Surveyor, except at Bristol, where the officer who tested the gas-meters tested the illuminating power and the purity of the gas as well. That was unduly multiplying officers, and was calculated to entail more expenditure than the performance of those duties really necessitated. About June, 1862, the Local Board determined as Mr. Hewett had said, to burn gas by meter, and in May of the following year, with a view of carrying that arrangement to perfection, the late Mr. Samuel Hughes suggested the appointment of a competent person to “take” the meters with the Gas Company's officer. The meters answered the purpose of enabling the Gas Company and the Corporation to arrive at a just and fair sum to be charged per lamp. In November, 1865, the duties of the Inspector were defined by a resolution of the Council as being to test the illuminating power of the gas, and its purity; but the latter had never been done, because an ordinary gas-fitter was unable to carry

out a chemical test. That appointment was made, in connection with taking the meters, testing the purity, and generally superintending the lighting of the borough, at £77 16s. per annum. In 1867, a contract was entered into with the Company to light the lamps at £2 7s. 6d. each, which effected a saving to the ratepayers of nearly £1 per lamp. At that period the meter system had practically come to an end, and with the end of the system came the time when the appointment of a special officer to superintend the lighting of the borough should end. About February, 1868, he found that the Inspector had to ask for instructions as to whether he should continue in his office, and, if so, what his duties would be, and he was instructed to go on testing the illuminating power of the gas, and generally superintending the lighting of the borough. He believed if they combined the two kinds of testing in Dr. Shea, it could be done for about £20 a year, and he felt that the superintendence of the lighting should be transferred to the Borough Surveyor. He had every confidence in the intention of the Gas Company to do what was honest and fair, if not more; and felt there was very little need of supervision and check upon them.

Mr. BEALE seconded the amendment, feeling that the only way to have gas of proper purity was to leave it in the hands of a competent individual like Dr. Shea; and that the offices should be concentrated.

Alderman PALMER heartily agreed with the principle underlying Mr. King's proposition—that it was desirable to concentrate all their work in the hands of well-known and responsible officers; but did not think in practice the amendment would effect a saving. He felt they had better refer the matter back to the Committee.

Mr. BRAIN said he had come prepared to move a resolution similar in effect to the amendment of Mr. King, but had put it aside in favour of Mr. King's. The *non possumus* of the Committee seemed to him an admission that what they were asked at the last Council to do was right, but that they would not do it. The Committee's resolution showed, however, that when the necessary arrangements had been made the illuminating power of the gas could be tested in those buildings without any trouble; and he said let it be done at once. He thought the Committee had hardly done justice to the Council, who unanimously referred the matter back to them last month. They were only making offices for men, instead of trying to concentrate them. To inspect the lamps was the duty of the Surveyor, with the assistance of the police; and then the lamps would not be so dirty as some he had noticed in the Oxford Road.

The TOWN CLERK, having explained that the amendment proposed by Mr. King was informal, and would upset all the Committee's report if carried, read the following, which was accepted by Mr. King in lieu of his own amendment:—“That the resolutions and proceedings of the Public Lights and Gas Committee be approved, adopted, and confirmed by the Council, except the resolution which proposes arrangements for testing the purity of the gas; and that in the opinion of this Council no arrangement for testing gas can be satisfactory which does not combine the test for purity with that of illuminating power, and that this duty should be performed by the Borough Analyst; and that to ensure due economy, the general superintendence of lighting should be placed under the Borough Surveyor; and that the Public Lights and Gas Committee be requested to take steps for carrying out such arrangements.”

Alderman MORRIS supported the amendment, on the ground that when the arrangement was made with Mr. Hart many years since, the duties were very different to what they now were. He hoped Alderman Hewett would accept the amendment; and if the Gas Committee would forget Mr. Hart, they would arrive at a satisfactory conclusion.

Alderman DARTER said if the Council chose, they could have reports, as to any irregularity in the lamps, from the police, by whom every lamp in the borough was seen every day. That was, he thought, the proper way of getting information as to the state of the town in all respects; no other plan could be so effective or cheap.

Mr. COLEBROOK did not think the care of the lamps would much increase the Surveyor's duties if the police assisted him.

Mr. BLANDY felt that as long as they had officers who did their work well they should not be removed without some reason being shown. Though he admitted to a certain extent the strength of what Alderman Palmer had said, he did not see that any of the gentlemen who had spoken in favour of the amendment had shown that the work had been done badly in the past, or had given any reason why the arrangement proposed by the Committee should not be carried out. After all, the proposal was of a temporary character, and it would be easy to concentrate the work when they had the new buildings. By entrusting the supervision of the lamps to the police, they would greatly divide the responsibility, and Mr. Parry already had his hands tolerably full.

The MAYOR strongly supported the Committee.

Alderman HEWETT, in reply, said the duties connected with superintending the gas were more onerous than many people supposed. Mr. Hart had performed them extremely well, and he failed to see that the change proposed would be of any benefit.

The amendment was then put, and, on a division, was lost, 7 voting for it and 10 against it.

Alderman PALMER then proposed, as a further amendment, that the suggestions contained in Mr. King's resolution should be referred to the Gas Committee with a view to their reconsideration of the matter.

The Ex-MAYOR seconded the amendment, which was carried, after some discussion, 10 voting for it.

**DEATH OF MR. W. CLARKE WATSON.**—A correspondent informs us of the death of this gentleman on the 6th inst., at the age of 40 years. Mr. Watson's first appointment as Gas Manager was in Ireland. He afterwards removed to Hexham, and had charge of the gas-works there, until an appointment was offered him to superintend the construction and subsequently the management of works in Sardinia. He remained there some years, and then returned to England, and held the post of Engineer and Manager of the Kingston-on-Thames Gas-Works. The offer of a lucrative appointment induced him again to go abroad, but unfortunately failing health and temporary loss of eyesight necessitated his return to England, after eighteen months residence in the tropics. Mr. Watson enjoyed the esteem of a wide circle of friends.

**INSTITUTION OF CIVIL ENGINEERS.**—At the meeting of this Society on Tuesday, May 7—Mr. J. F. Bateman, F.R.S., President, in the chair—it was announced that the Council have transferred Messrs. Thornton Andrews, C. O. Burge, H. P. Boulnois, Charles Copland, F. E. Duckham, R. G. Elwes, Richard Hodson, H. G. C. Ketchum, John Lawson, J. B. MacKenzie, Wm. M'Landsborough, Frank Morris, Thos. Newbigging, R. T. Smith, and A. H. Whigham from the class of *Associates* to that of *Members*; and had admitted Messrs. Charles Henry Ashforth, Arthur Horatio Brothers, Alfred Alexander Beggiano Chester, Frederick Richard Clapham, James Gillespie Clow, John Charles Lang, Charles Arthur Lovegrove, Percy Rickard, Edgar Smart, James Hardy Southern, James Naaman Taylor, and Maurice FitzGerald Wilson as *Students*. At the monthly ballot Mr. H. Rofe, Resident Engineer to the Nottingham Water Company, was elected a *Member*, and Messrs. Edwin Addenbrooke, Gas Examiner for the Commercial Gas Company's District; Frank Baker, Sheffield Water Company; and J. B. Ball, Engineer and Manager of the Loughborough Gas-Works, were (with others) elected as *Associates*.



## NORTH OF ENGLAND GAS MANAGERS ASSOCIATION.

The second and final Meeting of this Association for the Session 1877-78 was held on Saturday, April 27th, in the Board-room of the Newcastle and Gateshead Gas Company, Neville Street, Newcastle-on-Tyne—Mr. W. J. WARNER, of South Shields, President of the Association, in the chair.

The minutes of the last meeting, together with the financial statement—which showed a balance of £17 7s. 2d. in hand—both of which had been printed and circulated among the members, were taken as read, and adopted by the meeting.

The following new Members were elected:—

Bruce, Graham . . . . . Gas-Works, South Shields.  
Hardie, Wm., jun. . . . . " Redhough.

The following Associates were elected:—

Davidson, J. . . . . Dawsholm Gas-Works, Glasgow.  
Smith, W. W. . . . . Newcastle.  
Stewart, A. . . . . Glasgow.  
Turner, Joseph . . . . . Gateshead.

The President then delivered his Address as follows:—

Gentlemen,—By the special nature of the business of our first meeting, I was precluded from addressing you in general terms, as is usual with those occupying similar positions of honour to that in which I have been placed by your kindness.

Allow me to offer you my congratulations on the successful issue of that first meeting—in the large number of Members and Associates who joined us, in the broad and comprehensive nature of the rules which you adopted, in having the right of *entrée* into modern works of so extensive a character as those of the Redhough station of the Newcastle and Gateshead Gas Company, and in the very warm reception you met with and the generous way you were entertained by the Chairman (Mr. Hedley) and the Directors of the Company.

To return to our rules: "The object of this Association shall be the advancement of gas engineering, and the encouragement of discussion of all matters connected with the manufacture and distribution of gas and its products." This is the basis upon which our Association is placed, and on it is inscribed the threefold nature of our pursuits—professional knowledge, technicalities of manufacture, and the enterprise of trade. It is for the advancement of these that we are banded together. This is the sole object. No benefit can accrue to any Member or Associate but that flowing from an interchange of observations, experience, and opinions. In a professional sense, we are, then, a Mutual Benefit Society, and as members of it we are morally bound to promote the object of the Association, and to further its purpose. The book of our common professional life is now opened, with clear, unsullied pages, for your transactions to be recorded; let them be worthy of your profession and the great interests committed to your care, and they will then be worthy of yourselves.

As the advancement of our profession, in our associated condition, must come chiefly through the contribution of papers, it is desirable that these should aim at excellency.

Whether practical or speculative, I would not, however, be desirous of producing papers only for the purpose of provoking discussion. I do not hold the opinion of some, that these are the most useful, though often most acceptable. Upon common subjects common opinions are held, and freely given expression to; but does the expression of such opinions increase our common stock of knowledge? Are we mentally nourished and improved? I think not. Occasionally, useful hints may be thrown out and suggestions made, but if this be all that can be got from a paper communicated to a scientific body of men, such a paper must be pronounced a failure. Every paper delivered to an Association such as ours should be a communication in its widest sense—should convey a fact or develop an idea. This, it may be advanced, raises the standard too high, and will cause a dearth of papers. I hope not, as papers are as valuable to those who prepare as to those who receive them. My object is not to lessen the quantity, but to raise the quality to the highest excellency, as only by such communications can the object of the Association be attained—the advancement of gas engineering. The expression of ill-digested opinions can in no way advance our position, or improve our condition, either individually or collectively. Perfect essays upon abstruse subjects, or the communication of deep philosophical researches, it would not be reasonable to expect as forthcoming, from a body composed of so many grades as ours, upon the Committee requesting papers. But the Committee have a right to expect, and we are bound to respond to their invitation to communicate papers such as will advance our profession, and raise higher its tone and character. Such progress, however, is not beyond the power of simple papers upon common subjects, if such be carefully and conscientiously dealt with—not vague expressions of vague opinions.

My views upon this subject will be made clearer to you by one or two examples. The case of Grafton's experience in the formation of carbon, and its removal, is much to the purpose perhaps more so than any that can be adduced. He says, in "Clegg's Treatise,"—"The most eminent scientific authorities considered the accumulation as the result of high heat, and too great an extent of heated surface." It will be remembered that a large premium was offered for the discovery of the cause, and, therefore, we may assume that, had a paper been prepared upon this subject it would have been dealt with in this vague and general manner. Now note the difference in the treatment of the subject by Grafton: "I increased," he says, "the pressure to 14 inches, keeping up the usual heats . . . at the expiration of two months the deposit had reached 24 inches in thickness. . . . I applied myself to the taking off the whole of the pressure, except the half-inch dip in the hydraulic. Under this change, the same retort was worked for four months and scarcely any deposit appeared." This might be taken as an admirable model for a paper—a simple subject, but a very important one—worked out in a masterly way, and communicated with the idea thoroughly defined, and with charming simplicity of style. Now compare Grafton's observations and experiments with the treatment a kindred subject has received—the stoppage of the ascension-pipes, and you will not fail to see the importance of what I am now pressing upon you. Again, take the case of a paper on "Unaccounted-for Gas," in which the writer dwells upon the fact that the loss, if the gas is properly condensed, arises from defective plant—holders, mains, services, meters, and public lamps. If the writer of such a paper went no further than the expression of an opinion that the chief loss arose from one or other portion of the plant, he would fail to make a communication to the Association; but if, from observation and experiment, he showed the loss from each portion of the plant, or that it was all, or nearly all, from the services or meters, and that by the use of another meter, and the adoption of other kinds of service-pipes, or a new system of laying them, the loss would be prevented, then he would make his paper a valuable communication.

Though I have thus urged upon you the duty of communicating papers that may advance the professional character of our calling, yet it is no less the duty of the Members and Associates, than the aim of the Association, to discuss "all matters connected with the manufacture and distribution of gas and its products." Not as members of a professional Association only have we to meet, but as manufacturers and traders engaged in the same business—a business of great magnitude, in which

large interests are at stake, and affecting every community. The papers, therefore, of the commercial portion of our business should be as carefully prepared as the professional, and, in their discussion, there should be a deep sense of the responsibility of our individual positions. Ours is not a private business, it must always be borne in mind, and also that the public have a pecuniary interest in our undertakings. It is a matter of regret, I think, that such Associations as ours were not established at an early period of our history, as they would have advanced our business, and, by the diffusion of information, have materially improved our relations with our customers individually and collectively. It is not to financial questions only that I allude, but to the want of a general knowledge of manufacture, distribution, and business. A very general impression prevails that the business is very simple, quite of an ordinary character, and very easily managed. The making of gas, indeed, is little more than throwing coals into an oven and allowing the gas to flow away through a pipe. Of the complex character of the manufacture, of the incessant, anxious care attending it, and of the beauty, delicacy, and great accuracy of the apparatus employed, very few persons but those actually engaged in the business have the remotest idea. And so, too, with the most important financial questions with which we have to do—price and capital, the former being dealt with irrespective of the other, and the latter without reference to antecedent prices affecting that capital. So it is with the comparative prices of different towns. They are dealt with, too, without any reference to disturbing causes, the lowest being invariably taken and applied as a measure to a remote district, and, unconsciously often, an injustice done to those honestly and zealously engaged in a business with no ordinary limitations and restrictions. But the general ignorance of gas matters is not confined to the working of such undertakings, it extends to the houses of the consumers, in the use of bad meters, bad fittings, and bad burners. The simple index, from the record of which the consumer is charged, is scarcely ever read, from the want of the knowledge to do so. The advantages of gas for other purposes than that of lighting have been but slowly recognized. Gas coke, an excellent and economical fuel, is almost ignored for ordinary domestic purposes.

We are beginning, I think, to feel that we are somewhat responsible for the ignorance which prevails, and which doubtless affects our interests. While admitting this, however, we must not lose sight of the fact that we have had an immense amount of prejudice to overcome—the prejudice of the consumer, and the prejudice, as well as the ignorance and interests, of intermediate workmen. From the latter we suffer as much as ever, and have little or no remedy, while the consumer can go from shop to shop seeking the lowest prices, without reference to the size of the pipes and the quality of the work. In this matter there is nothing in common between the consumer and fitter, but with the company and consumers there is an identity of interest. It is, therefore, much to be regretted that the attempt made some time since to schedule the size of pipes in an Act of Parliament was not successful, as this would have done much towards preventing that undue amount of competition which exists, and which offers a premium to the unscrupulous shopkeeper, entirely excluding the honest tradesman with a position and reputation. With pipes of ample capacity in the interior of buildings, our pressures could be materially reduced to the advantage of the producer and consumer. If the weights of pipes were also scheduled, the advantage which the unscrupulous man has over the honest trader would be reduced to a minimum, and less apparent advantage would be offered to the consumer. Add to this the power of the Company or Corporation to inspect fittings, and reject them, if not approved, at a small cost to the consumer or fitter, as they were satisfactory or otherwise, and all the annoyance that the consumer suffers would be at once got rid of. We should then cease to be in the present disgraceful position of having to employ an instrument for the so-called measurement of gas that is totally unreliable. Is it not a disgrace to us as professional men, as tradesmen (I leave out of sight the fact that we are the Managers of large undertakings, the representatives of Companies and Corporations), is it not a disgrace to us, I ask, that we should have to use an article that may vary to any extent, through the want of a little care and attention in running the pipes through a building; while with this care a meter can be used that will measure absolutely correctly? I may say, before leaving this, that for many years the Paris Gas Company, with their enormous business, have had the power of supervision and control over the fittings of the consumers.

With improvement in the canalization, might we not hope for improvements in the fittings, and so impress art as well as science into our service. There is great need of this, though considerable improvement has been made, and work designed with much taste. Progress will be very apparent on comparing an old with one of our best and latest pattern-books. It will be seen that real artistic progress has been made in the substitution of a natural and an elegant arrangement of decorated tubes for the massive and so-called classic grandeur of the suspended wash-hand basin and ewer. The combination of these tubes, however elegant, suspended from the ceiling, do not appear to me to do justice to the great adaptability of gas lighting. We have got into a deep rut of custom and prejudice in this matter; to light by brackets is much more elegant to my taste. The light is more diffused and pleasant, and arrangements can be better made for carrying off the products of combustion; but would not portable standards in some instances be more elegant, and in others external lights with stained glass windows, add grandeur and beauty to halls and staircases? These things are not beneath our notice; they will add beauty and comfort to our homes, they will improve the taste of the masses, and will materially increase our business.

In the application of gas to the warming of rooms, is there not, too, the running in the old rut of custom and prejudice—asbestos, fire-clay balls, &c., placed in a common open grate with a chimney that could not be better designed than it is for carrying off the heat as generated. The arrangement most desirable is the appearance of cheerfulness, and the utilization of as much heat as possible, without giving the stove the form of a closed one. In the matter of heating apparatus, the Stockton Exhibition certainly showed an improvement over those at Shields and Carlisle. Hence the value to the whole community of the inauguration of this movement—a movement which will be further developed, as is the case at Birmingham, and which will do much to remove the reproach from Companies that they have failed to educate and to popularize.

In the "Circular to Gas Companies" in the last issue of the JOURNAL OF GAS LIGHTING, the writer says: "Let all do their utmost to promote consumption." To popularize is to increase consumption. To make known the relative cost of gas and other modes of artificial light is to popularize gas; to show its safety, its adaptability, its salubrity, and the beautiful softness and controllability of the light, is to popularize it; to show its cleanliness, safety, and comfort in warming and heating is to popularize it; and to show its economy and efficiency for producing motive power at will is to popularize it. Here there is a large field in which we may work, together and separately, with great success, having, too, the goodwill and co-operation of the consumers. They having a common interest in this work with ourselves, both may be peculiarly benefited; for to increase the consumption is to reduce the price; and, as these two act and re-act on each other, to reduce the price is to increase the consumption, and allow the cheering rays to penetrate the gloom of many a humble home.



At the formation of a Society such as ours, the President's attention, perforce, will be directed chiefly to the framing of a constitution, and to the setting forth of the objects of the Association in a general manner. I have felt this to be my duty, and however inadequately I may have done it, my desire has been, with your assistance and support, to place the Association on a sound basis. I have also attempted to give a direction to the current of your business, but you must mould it into shape, and give it a life of usefulness and honour. I have glanced at many subjects, but the real work is with you; only your papers and your discussions can reflect credit upon the Association, extend its usefulness, and promote its objects.

The meeting having thanked the President for his very interesting address,

Mr. HEWORTH (Carlisle) read the following paper

#### ON WASTE IN GAS-WORKS.

It was recently remarked in the pages of the JOURNAL OF GAS LIGHTING that "in gas-works everything is utilizable—not a particle of matter to be found in the works should be wasted."

The proposition is one which, for the most part, ought to be self-evident, and to many who are engaged in the management of gas-works it doubtless is so; moreover, there are good grounds for saying that it has in many instances long been acted upon, to the great advantage of gas-works proprietors.

The proposition, however, is one worthy of being repeated and remembered; and it is in the hope of calling attention to its importance that the writer now ventures to offer some simple observations in illustration of it.

The term "waste," as applied to gas-works, may, in its broadest sense, be said to refer not only to the products of manufacture, which being once obtained are afterwards allowed to be partially lost, but also to those products which are neither manufactured nor sold to the best advantage.

As the question of waste not only affects the dividends, but also affords a test of management, it may certainly receive the brief attention of the members of this Association.

What are some of the sources of waste? 1. In the manufacture; and, 2, in the distribution of gas and its residual products.

#### In the Manufacture of Gas and Residual Products.

**Fuel.**—The coke used to carbonize coal amounts to about 20 per cent. on the make in several well-managed works; it has been even less than that, and possibly is now; but in many places it approaches 50 per cent., and there are other places (as where canal is used) where even this per centage is much exceeded. The difference represented by these figures is not necessarily all waste, but may arise partly from the difference in the sizes and mode of setting retorts suitable to the varied requirements of different works. But when all this has been taken into account, there is still, in many instances, nothing less than gross waste in the fuel used as compared with the work performed.

It is impossible to fix a standard per centage of fuel to meet all cases, but where it much exceeds 25 per cent., the fact may be worth consideration under the head of waste. And when the greatest economy has been exercised, the residuary heat passing from the chimney into the atmosphere is quite sufficient to suggest at least a passing inquiry whether that could not to some extent be partially utilized, in more cases than it is, for raising steam and for other purposes.

**Coal.**—There is coal and coal. Local circumstances must decide the question as to the cheapest market for coal as respects price, but it needs not to be demonstrated now that a low-priced coal is not necessarily the cheapest; and apart from this phase of the question, and whatever coal is used, it is beyond dispute that waste is only of too common occurrence in the carbonization of coal. The writer knew a coal in use at three different works, and the yield of gas per ton at the respective works was 9600, 7280, and 6800 cubic feet. At the first only of these works an exhauster was used, but there was no reason (beyond that of parsimony) why an exhauster should not have been in use at all the works; and even without an exhauster, nothing can justify a waste of 2800 cubic feet, or nearly 30 per cent. of gas per ton of coal. It may be said that such instances are rare; certainly it is to be hoped so; but where the yield per ton is at all less than it is possible to obtain in ordinary practical working, it may fairly be described as waste, and ought to be remedied.

Waste from imperfect carbonization (as in the case of fuel) is probably caused chiefly by the defective setting of retorts; and at this day there can scarcely be an excuse left for ignorance as to the best mode of setting retorts.

**Residual Products.**—If the residual products arising from the manufacture of gas are looked into, it will be found that much waste now going on is preventable. There was a time when little or no demand existed for residual products of gas manufacture. Happily, that time is gone by.

**Coke.**—With respect to coke, all that need be said here has already been said under the head of "Fuel," unless it be a word to call attention to the waste which sometimes is allowed to arise from the ash-pits. If the coke cannot be picked out when the ash-pits are emptied, and if it will not "pay" to screen these ashes afterwards, then surely it might be possible, in places where fuel is costly and poverty rife, to give away rather than waste even so worthless a product.

**Tar and Ammoniacal Liquor.**—With respect to tar and ammoniacal liquor, probably no great difference exists in the quantity of tar produced per ton of coal at medium-sized works, and where the temperature of the retorts is nearly uniform. Greater difference exists in the quality and strength of ammoniacal liquor produced, and both are partly dependent upon the kind of coal used. Any comparisons to be instituted must, of course, be as between coals whose liquid products are similar. If the gas made be thoroughly condensed and thoroughly washed (in scrubbers or washers), there can be no difficulty in securing all the tar and liquor that can be profitably obtained. But so long as ammonia is allowed to go out with the gas, instead of being washed out and converted into sulphate, or some other marketable form of ammonia, absolute waste exists. Such waste is not uncommon. The sale of ammoniacal liquor per ton of coal at one work known to the writer is 22 gallons of 6° Twaddel; at another, 10 gallons of 4½° Twaddel; at another, *nil*; yet all these works are using similar kinds of coal, and are within reach of the same market for the liquor! The conclusions to be drawn from these figures are obvious.

**Gas used on the Works.**—The consumption of gas at the works is oftentimes excessive, simply because there is no account taken of the quantity consumed; and therefore no check applied. Let the gas be duly passed through a meter, and the index taken periodically and compared, and the consumption may be reduced to a legitimate quantity.

Having enumerated some of the sources of preventable waste in the manufacture of gas, what are some of the sources of waste

#### In the Distribution of Gas and its Residual Products?

**Gas.**—The per centage of unaccounted-for gas has, in recent years, been so much reduced in some of the largest works in the kingdom that very little opportunity remains for the further prevention of waste in this direction so far as those works are concerned. In three of the metropolitan gas-works the unaccounted-for gas in 1876 was under 6 per cent., and the average of the whole of the metropolitan works was only 6.38 per

cent. Results much less favourable than these are more common in the provinces.

It was no common thing, a few years since, to hear of small gas-works where the unaccounted-for gas amounted to 25 per cent. of the gas made, and, for anything that appears to the contrary, had continued so for years in succession; and, as if to show how some companies, as well as individuals, are able to resign themselves to misfortune, the companies appear to have gone on cheerfully enduring the 25 per cent. loss, but compensated themselves once a year by dividing the modest dividend of 10 per cent. on their capital.

Mining districts excepted, there surely is no necessity for a leakage of above 10 per cent.

With this question others are involved, such as condensation, sound mains and services, and correct registration of meters; but with these matters attended to, why should there be a resting-place till the unaccounted-for gas is reduced to 5 per cent.?

**Residual Products.**—Any waste that occurs in the distribution of the residual products may readily be dealt with. Assuming that these products have been fully secured, the problem left is—How and where to sell or work up these residuals?

It may be remarked generally that, where a demand for any of these products does not exist, there is at least room for supposing that it may be created.

If coke cannot be sold in one market it may in another; but, if it cannot be sold as coke, can it be sold as breeze, or, as has been advocated, as fuel when mixed with tar? If the gas consumers will not come for the coke, it may be as well to take the coke to the gas consumers. There can be no difficulty in disposing of coke ultimately, and, in order to prevent waste, it is only necessary to ascertain which is the best market.

If the tar and liquor are not treated for other products, they can be sold. They certainly ought not to run to waste, as is the case in some small works. If the tar and liquor are sold, they should be sold to certain standards of strength agreed upon, and any deviations from the standard should be provided for in the contract by a scale of prices *pro rata*. They should also be sold by weight or by measure, and not for a lump sum. The writer knows of an instance where the revenue for tar has within the last twelve months been increased 150 per cent., and the revenue from ammoniacal liquor 600 per cent., by simply adopting these methods of selling these products.

If the tar and liquor, instead of being sold, are treated for other products, the possibilities of waste still exist, both in the mode of working, and in the returns obtained, which, under precisely similar circumstances, are often found to differ as much as 30 per cent.

There are other residual products yet to be dealt with, viz.:—

**Refuse Lime, Ashes, &c.**—The ashes produced at gas-works are, in some towns, in regular demand, and are sold at fair prices, while, at other works, there is not only no demand for them, but there is a great difficulty experienced in disposing of them, even by paying for cartage; and the same may be said of refuse lime, and even more, as there are greater difficulties in the way of its disposal.

The process for revivifying spent lime recently advocated may, where lime is costly, or where the spent lime is a nuisance difficult to dispose of, be the solution of a difficult question; but, in cases where no gain can be secured by the revivifying process, it may be as well to dispose of two difficulties at the same time, by converting the waste ashes, bricks, &c., and the spent lime, into a mortar, which may be used for luting in the retort-house, and which, with a portion of fresh lime added, may be readily sold to builders at a remunerative price.

**Spent Oxide, Carbon, &c.**—The various ways in which spent oxide and the carbon removed from retorts may be utilized, are so well known that there is no difficulty in profitably disposing of these products in works where they are found.

Other sources of waste doubtless exist, and other means of remedying such waste might have been suggested; but enough has been written to call attention to the subject. Only one observation need be added. In order to prevent waste in gas-works, let every Manager carefully analyze his own working results, and compare them with those of his neighbours similarly situated, and also with those of the best conducted works in any part of the country where these results are published. Such a comparison ought to lead to results that would be as creditable to the Manager himself as they would be profitable to the Company or Corporation whom he serves.

Mr. FORD, of Stockton, read the following paper on

#### OBSERVATIONS ON THE ELECTRIC LIGHT AS APPLIED TO WORKSHOPS, ETC.

The subject chosen for this paper is a pre-eminently interesting one to those professionally connected with the manufacture of artificial light, and my only regret is that the times and opportunities at my command, for the actual viewing of the electric light in operation, have unavoidably been so limited as to compel me to give but a short *résumé* of what might be written on the subject, were your time not to be otherwise occupied by contributed papers on other topics.

Much has, during the last little while, been said and written about the electric light, and the probability of its partially or entirely superseding the use of coal gas and other means of artificial illumination, and many doubts and fears have been expressed and acted upon from time to time, causing relative fluctuations in the commercial value of undertakings such as those with which most of us are in some way connected; but, hitherto, the *ultimatum* of each spasmodic action of this kind has been a return to the former and original value of the concerns alluded to. These periodical fluctuations may be principally attributed to the apparently successful experimental results which are from time to time brought before us by gentlemen in some cases devoting their entire time, means, and energies towards the further development of this kind of light, which has undoubtedly, by their efforts, been brought to a most wonderful stage of success. But experiments of this kind are generally conducted under circumstances the most favourable to a successful accomplishment of the end desired for the time being, and are usually wanting in many of the practical elements essential to a commercially useful and continuous application of the principles involved, so that when these principles come to be worked out in a manner calculated to be of practical utility, many failures, more or less complete, have to be encountered, and many difficulties to be overcome, before the end aimed at is reached.

This seems to have been especially the case in the employment of electricity for producing light. Many and numerous are the methods that have been tried to create, by its agency, an artificial light superior to any that was previously known, and the most successful of these has undoubtedly been what is commonly known as the electric candle, which seems to be neither more nor less than two currents of electricity communicated to two tapers of carbon, the points of which are maintained at a regulated distance, whilst the carbon particles of each taper are being consumed to create the light desired. It is not my intention to draw any invidious comparisons between the light thus created and that generated from gas coal, for such a comparison is beyond the scope of this paper; but my object is merely to give expression to some observations obtained from a view of such light in actual use in workshops of very considerable magni-



tude, and this I venture to do in the belief that such a sight is one of no little interest, and one which has, perhaps, not been personally inspected by all of us.

The apparatus which is used in producing the light I speak of is what is commonly known as Siemens's, and is of considerable magnitude, as the space it is desired to illuminate is extensive. There are two such in operation in different shops—one in a boiler-shed and one in a fitting-shop, both belonging to the same firm of engineers. The electricity required for the production of the light is generated by a powerful rotary drum (lined with insulated wires) which is driven speedily round its axis by a four-horse power engine, and against this drum gently impinge fixed brushes of brass with but little friction. The mechanical force thus employed creates the electricity, which is conveyed to coils of insulated wire, and these are in course conveyed from where the generator is stationed to such position as the electric lamp may be desired to stand; in this case a distance of about 120 feet. These wires are then connected to the carbon tapers or pencils, which are about 18 inches long and half an inch thick, and are so fixed (one from the top and one from the bottom) on a delicate and most ingeniously constructed self-adjusting instrument, called the lamp, by which the relative distance of the carbon points, when once adjusted by the operator, is maintained, checked, and regulated by the same currents of electricity which produce the light. One pair of carbons lasts about four hours, and requires to be replaced by a new set; but as the top carbon is consumed much the quicker of the two, lasting only about one-third of the time that the lower one lasts, the interruptions of the light are much more frequent and irregular than once in four hours.

The light from each of the two electric lamps that I speak of is intense in its brilliancy, and has, when looked at, a very decidedly dazzling effect on the eyes, somewhat akin to that experienced when one looks at the sun with the naked eye. The lighting portion of the arrangement is elevated a considerable distance from the ground level, in order to diffuse the light as much as possible, and to obviate the discomfort occasioned by its effects on the eyes, and the light created shines a beautiful white clear light, brighter in quality, but somewhat like in colour to the light reflected from the moon at its full on a very clear night, and it gives the coal gas flames which are seen in its neighbourhood a dull, yellow, candle-like appearance, which contrasts unfavourably with its clearer rival. Where the light from the electric lamp is obstructed by workshop materials or tools, a dense dark shadow is cast behind these, and it is here that the coal gas proves its almost infinite divisibility, and is used to disperse the darkness occasioned by the brighter light, which cannot thus be subdivided. These shadows might, or may possibly through time, be partly lightened by the use of reflectors, arranged in suitable positions to throw back the light, instead of having recourse to gas-jets; but it seems to me that this is in some cases almost impracticable from the fact that the reflectors would require to be continuously moved or in motion to obtain the desired effect, and, where economy in the lighting arrangement is the desideratum, this would add much to the cost of the electric light. The effect of the new light, as used in the boiler-shed, seemed to me to be more agreeable and less pernicious to the eyesight than in the fitting-shop; for, in the latter, where the fittings and tools are principally formed from polished metals, the reflection is more severe than in the former, where the dull iron is generally used, and from the reflection from which comparatively little discomfort is experienced.

The fact of the carbon points being so quickly consumed, and requiring so much—almost constant—attention, and the variability of the distance of the carbon points from each other, caused by the more or less rapid and eccentric consumption of the carbon particles—a defect which even the beautiful adjusting mechanism cannot altogether obviate instantaneously—are drawbacks against the use of this beautiful light; for as soon as the distance of the points is varied, so soon is the intensity of the light affected, and lessened or increased, as the case may be, thus giving to the light a dangerously fluctuating effect in general (which is far from pleasant), and in some cases totally extinguishing it, both faults of a very serious nature, when it is considered that, without the assistance of the constant and reliable coal gas supply, the danger, inconvenience, and expense of such irregularities as those of this electric light are such as to lead to the destruction or damage of the materials, workmanship, and tools for the guidance of which the light is intended. A supply of coal gas must also be necessary at each change—and they are frequent—of carbon points, unless the place could afford to be in total darkness whilst the operation is being conducted, or a second electric lamp be fixed, to work whilst the first is having its carbons rearranged.

The lamp, properly so called, is, in itself, as I have said, a most inge-

nious automatic arrangement, very delicate in its action, and therefore liable, one would think, to get out of order; certainly it takes a deal of attending to while in operation, and requires almost constant watching.

It may be well for me to mention here that the two electric lights alluded to in my observations were not brought into use with a view to economize coal gas, nor have they tended towards such a result. The object aimed at was the clearer illumination of the area enclosed by the buildings, and in this respect they seem to answer admirably.

I hope on some future occasion to enter more fully into detail as to the comparative cost, utility, convenience, and physical effects of light from coal gas, as compared with those of the electric light; but on the face of observations such as those I have had, it seems clear that the light given by electricity as much transcends the quality of that produced from coal, as do the indefinite divisibility, cleanliness, and ease in application of coal gas exceed these attributes as applied to the electric light.

The CHAIRMAN said he had seen the electric light in a boiler-shed a short time since, and the effect of the light on the eye was such that he felt it on the following day.

Mr. NELSON (Glasgow) said that he had taken considerable interest in the light when it was first introduced. He had seen it used at the Tay Bridge, to enable the men to work there at night, when gas could not be employed. It was eminently useful. In connection with docks it was very applicable; but he thought the promoters of the light were damaging their own interests by pushing it into a position to compete with gas. He did not think that it could, in its present form, compete with gas, not even in workshops, and certainly not in dwelling-houses. One great objection to its being used in workshops was that it did not diffuse itself like gas, and left shadows behind every article.

Mr. W. SMITH (Darlington) said that the cost of the electric light was too enormous to use in private dwellings, workshops, or yards, but it might do for lighting large squares in towns.

Mr. HARDIE (Newcastle) said the light was now being exhibited in the Art Gallery of Newcastle, and, although very brilliant, was rather offensive to the naked eye. It had been said that it was equal to 6000 candles, and rivalled the light of the sun; but this was, no doubt, a momentary enthusiasm which would soon pass away. There had been no improvement in the light itself, which was the same as many of them had seen at different times during the last quarter of a century, but there had been an immense improvement in the apparatus for producing it. Its two defect, however, remained—namely, its intensity and uncertainty.

(To be continued.)

ROCHDALE CORPORATION WATER-WORKS.—At the annual meeting of the Rochdale Town Council, on Thursday, the 2nd inst., the Town Clerk read the following, which is the annual report of the Water Committee:—

The Water-Works Committee report that during the past year there has been the following increase in the number of tenants and the amounts of the water-rental, viz:—

Water-rate for the year ending March 25, 1878.	£17,629 7 2½
Do. Do. 1877.	16,802 9 11½

Showing an increase of . . . . . £826 17 8

Number of tenants supplied, March 25, 1878.	19,027
Do. Do. 1877.	18,697

Showing an increase of . . . . . 330

The filling of Cowm reservoir was commenced in January, 1877, and in July of that year it overflowed for several days, and continued nearly full until the middle of August, when, in consequence of appearances which indicated that the puddle was again being abraded by the action of water, at a point more westerly than had been before noticed, it was decided, under Mr. Hawkesley's advice, to empty the reservoir, and to sink a trench commencing at the west end of the wall previously put in, parallel with and next to the puddle, so as to ascertain the precise point at which the mischief was going on. This trench was opened for a length of 72 feet, and to a depth of 95 feet, and it was discovered that owing to the wash of water rushing into the large fissures in the rock lying under the shale, the puddle was being damaged in various places. It was then resolved to construct a concrete wall against the side of the puddle, to protect it from this wash. This is now being done, and it is intended to extend this wall for a certain further distance towards the west end, with a view to prevent any further abrasion of the puddle in this direction.

At Spring Mill the work is proceeding satisfactorily, nearly the whole of the brick-work and masonry in connection with the tunnel and shaft being completed, and the embankment and puddle gutter in a forward condition.

If the Cowm Reservoir had now been in operation, as we anticipated, the whole of the interest on the capital expended would have been charged to revenue, and a deficiency created which would have necessitated a rate during the ensuing financial year. Under the circumstances it has been deemed advisable to pay a portion of the interest, on the works in progress, out of the accrued profits, and for that purpose a sum of £6300 has been appropriated.

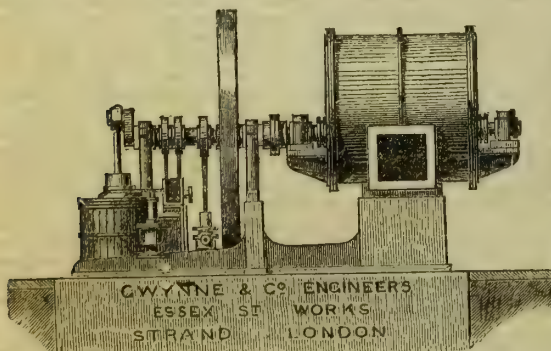
The question of pure water in connection with the health of the town and neighbourhood is of such vital importance that it should be generally known that the Corporation are now in a position to give a constant supply to the whole of their district.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



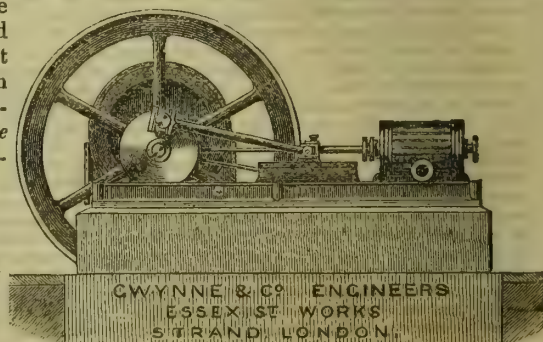
EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

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## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

## THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 21, 1878.

## Circular to Gas Companies.

We have had some experience of "Regulations" Bills in this country; but our American brethren—the Gas Companies in New York State—are just now exposed to an infliction of the sort, with which we in this country have had nothing to compare. A Bill has been introduced into the State Legislature, which, in the first place, proposes to fix the price of gas according to the population of the district in which the Company exist. There is some reason in this, which is recognized here; for a sparsely populated district cannot possibly be supplied so cheaply as one densely inhabited. But there are other things, besides the density of population, which govern the cost of gas, and must necessarily interfere with the price. We are not informed what differential rates the Bill proposes to inflict on Companies who supply a population of, say, 10,000 or 100,000. We may, however, in broad terms, admit that, all other things being equal, the latter number should be supplied with gas cheaper than the former. The Bill introduces a startling novelty in the standard for estimating the illuminating power of the gas. It proposes to enact that gas of sixteen-candle power shall be furnished; but the standard candle is to burn at the rate of 132 grains per hour. Thus the gas must really have the illuminating power of, at least, eighteen candles, estimated by our standard candle burning 120 grains per hour. Why this number has been chosen—unless it be to plunder the Gas Companies—we do not know. Of course, a candle may be contrived to burn, as near as possible, 132 grains per hour; but there can be no substantial reason for varying a standard which is now common to all parts of the world. The most extraordinary part of the Bill is, perhaps, the section which proposes that consumers shall not be compelled to pay for gas supplied to them below the standard quality, and that the Company shall be mulcted in a fine of one

hundred dollars for every default, which fine is to go to the informer. We believe the arrangements for testing gas in New York City are very good; but the "informer," in some of the smaller towns in the State, might be a very troublesome character. The wonder is that a Bill of this absurd and monstrous character should, even in the Legislature of New York, have passed to a third reading; that it will become law, we cannot believe. Such an Act, if fully carried out, would of necessity shut up every gas-works in the State; but the probabilities are that the threatened legislation is only intended as a means of extorting money from the Gas Companies. Some dollars and cents will probably square the whole business, and the trading politicians will go home perfectly satisfied with having done their duty—to themselves.

Complaints are made of a nuisance produced at the gas-works of the old Ratcliff Company. Long experience has taught us that these complaints are almost invariably exaggerations. That a smell which some people dislike is produced, we shall not dispute; but that this is at all disgusting, or in any way prejudicial to health, we emphatically deny. An attempt has been made to induce the Metropolitan Board of Works to prosecute the Company for a nuisance; but the Board acknowledge that it is not their duty to take proceedings. If the Vestry of St. George's-in-the-East choose to do so, they must take the risk. It seems perfectly clear that the nuisance, if any, is but slight, and the cause of it already in the course of removal.

That very singular body, the Select Vestry of Richmond (Surrey), have been, as they suppose, making an experiment with the average meter system. They placed meters in the proportion of one to sixty-three lamps, and seem astonished when they are told that meters fixed in this proportion cannot be depended upon to furnish a reliable average. One to twelve lamps is ordinarily employed; but one to twenty has sometimes been used. The latter, however, is, in our opinion, too large a number, except under particular circumstances. The Richmond Vestry object to spend more money on meters, and have referred the question of the adoption of the average system to the consideration of a Committee. They may be perfectly content with the supply as furnished by the Company, certain that, if one lamp burn less gas than is contracted for, at least two others are consuming a great deal more. We have not the smallest objection to Vestries exercising the utmost economy they can in the consumption of gas in the public lamps, but we cannot allow this economy to be practised at the expense of Gas Companies.

With the consent of the ratepayers, Local Authorities may economize as much as they please when they themselves are the purveyors of Gas. The Corporation of Birmingham are, for instance, economizing, and the Watch Committee of that town save £1000 a year by extinguishing the street-lamps at two o'clock in the morning; but various evil results follow. Mr. William Sykes is abroad, and burglaries are not unfrequent. Strange to say, the police sergeants are unable to find the constables in the darkness—a fact at which we, with our knowledge of London streets, in a tolerably full light, are not at all astonished. These foolish economies only bring ridicule and disgrace upon the Lighting Authorities. That a large quantity of gas is needlessly consumed in the early hours of summer mornings we willingly admit, but paltry savings like that attempted in Birmingham only bring contempt on the Local Authority. In winter, the working man who has to start for his shop before daybreak needs gas to light his way, and to deprive him of its help entails a serious inconvenience.

We have before referred to the gas accounts of the Corporation of Rochdale, which, as we have said, show very favourable results from the past year's working. That the revenue should have been reduced is not surprising when we consider the reduction in the price made in 1877. It is, however, gratifying to notice the decrease in the working expenses recorded, as compared with the previous year. Thus we find that in 1876 the wages of stokers amounted to £3819, while last year the sum of only £3158 was expended under this head. The result may, perhaps, be ascribed in part to the use of Foulis's hydraulic stoker. The cost of purification was also reduced from £1062 to £525—a very satisfactory result, if the gas was as well purified as in the previous year. Last week we remarked on the amount of profit, and wondered how it was to be applied. True, it amounts to but five per cent. upon the present estimated capital; but even this is too much.

It seems to have been resolved by the Brighton Town Council that the Gas Companies within their limits are effete undertakings, and, therefore, they will make no attempt to purchase them. The grapes were beyond the fox's reach, and, therefore, Reynard decided that they were sour. The idea of resuscitating



the old Aldrington undertaking, and by this means enabling the Corporation to compete with the existing Companies, is quite worthy of a Town Councillor, who would see with satisfaction the streets torn up in every direction to gratify his favourite whim. The scheme, however, could not be revived without the sanction of Parliament, and the Legislature never allows Local Authorities to compete with Companies. Councillor Savage is perfectly right when he recommends his brother Councillors to take notice of the electric light, and advises them to abstain from gas manufacture. The worthy Councillor is a far-seeing chemist, who, no doubt, knows all about it. The Corporation had better at once make an experiment by illuminating the dome of the Pavilion with the electric light. They may thus acquire a knowledge of the relative cost of electricity and gas.

The Town Council of Winchester, contrary, we are certain, to the wishes of the inhabitants, have decided on lighting the city with oil for another year. The Gas Company refuse to contract for a shorter period than three years, and the Town Council decline to make an agreement for a longer term than one year. We may suppose that the Council expect gas to become cheaper and cheaper every year, and for that reason abstain from making a long contract. There is besides the bugbear of the electric light, which all enemies of Gas Companies affect to believe in. The Companies, however, are not so easily frightened. They can regard the advent of the electric light with perfect equanimity, and are, of course, not disconcerted by the appearance of sooty oil-lamps. The Winchester Gas Company made a really liberal offer; but its acceptance would have involved an expenditure on the part of the Council to undo some of the work which they had done. This was too bitter a pill for the majority of the Council to swallow. So the rate-payers are forced, by their obstinate representatives, to submit to the half-relieved darkness, against which they have almost unanimously protested.

The Local Government Board have sanctioned the borrowing of £71,000 by the Corporation of Stafford, to purchase the undertaking of the Stafford Gas Company. The Shareholders will, therefore, be paid off at once, and the Company dissolved.

The auction clauses are being applied by Mr. Raikes's Committee in what we might call a somewhat capricious manner. The York United Gas Company, whose Bill proposes to limit the dividend on new capital to five per cent., have escaped these clauses altogether. The Radcliffe and Pilkington Company, whose wish was to raise £120,000 entitled to seven per cent. dividend, have the auction clauses applied in respect of £80,000 of the new capital, while £40,000 remains to be distributed amongst the existing Shareholders. The reasons the Committee give for this are, that the Company supply a sparsely-populated district of large area, extensively undermined, which occasions a considerable loss from leakage. It seems also that the dividends of the Company have been but small, and at all times uncertain. It may be that in this case under the operation of the auction clauses, the present holders will be able to obtain new shares at something less than par, unless outsiders are willing to pay a high price for low and irregular profits.

At Shrewsbury, the Shareholders of the Gas Company were recently called upon to decide whether a portion of the new capital authorized by their Act, just passed, should be offered to the public by auction or tender. It was decided to put them up to auction, which, perhaps, is the best way of getting the longest price.

We commence to-day our report of the recent meeting of the West of Scotland Association of Gas Managers, and publish in the present number a useful and suggestive Address by the President, Mr. M'Gilchrist. He brings forward two or three practical points. There is, for instance, a question of the desirability of keeping in the gas the vapours of naphthas, which, condensed into liquids, flow into the tar-well, for the advantage of the tar distiller. There could be no question that the idea which is prevalent at the present time—viz., that of separating the tar from the crude gas at as high a temperature as possible—will, if carried into practice, assist in keeping the naphthas in solution in the gas; but, then, it must be remembered that gas carrying a large quantity of naphtha vapours will not stand much scrubbing without a decided loss of illuminating power. Some means must, therefore, be used for removing as much ammonia as possible before the scrubber is reached. It is not for us to pick out a process, from the many before the profession which promise to accomplish the desired end. Mr. M'Gilchrist seems to think that the Metropolitan Gas Companies will soon be required to increase the illuminating power of the gas they supply. Our own opinion is, that Scottish Companies will be compelled, by the failure of rich cannel, to reduce the power of their gas before

we in London increase ours. Nevertheless, so soon as we are shown a process which will enable us to raise the illuminating power of gas from common coal, we shall be very happy to adopt it; it being thoroughly understood that the better the gas the more money the public will have to pay for it. There are two or three other points in Mr. M'Gilchrist's address which we should have been glad to notice, but space fails us.

The paper read by Mr. Aitken, "On the Influences of Aqueous and Other Vapours on Illuminating Gas," also possesses many points of interest. We confess we do not quite understand the experiments on the influence of benzole and light naphtha vapour on illuminating power. They are, we rather think, opposed to general experience. That 1.6 gallons of light naphtha should cause an increase of illuminating power in ten thousand cubic feet of gas equal to that produced by 2 gallons of benzole, is remarkable. The influence of aqueous vapour, as determined by Mr. Aitken, is well worthy of attention, although it is of little practical importance, inasmuch as gas cannot be kept dry. Atmospheric air acts, it would appear, as a simple diluent, and beyond this it has no special influence, as some have supposed it had, in reducing the illuminating power of the gas. We are sorry that Mr. Aitken did not extend his experiments to the determination of the influence of carbonic acid on illuminating power, for we have a strong suspicion that erroneous notions prevail on the point. It would be well worth the while of any Gas Manager, who has apparatus and leisure, to make careful experiments on this matter.

We call the attention of our readers to the issue, this day, of the First Volume of our Treatise on the Manufacture and Distribution of Coal Gas. It is a handsome book (of four hundred and sixty pages, illustrated by five hundred and twenty-one woodcuts and thirty-seven page engravings) bound in morocco, with cloth sides, and gilt edges, and would form an ornament in the library, and useful guide in the office, of every Gas Engineer.

### Water and Sanitary Notes.

It is never safe to prophesy till after the event. Misled by the papers of the House of Commons, we announced, last week, that Sir J. M. Hogg had withdrawn the Water Bills of the Metropolitan Board. Home Rulers, however, interfered, and the honourable baronet had no chance of bringing forward his motion. Others have stood in the way since, and Sir J. M. Hogg is now laid up with the gout, so we shall not pretend to say when the Bills will be withdrawn. It is enough for us to know that they are doomed.

The Metropolitan Board of Works seem incapable of taking a hint. The Home Secretary has told them, in tolerably plain language, that he is not satisfied with the Bill they have promoted for the Prevention of Thames Floods; and, at the same time, has intimated that he desires to see a Bill introduced to carry out the suggestions of the Select Committee of last year. The Board, however, have decided on writing to Mr. Cross, to ask him to more explicitly state his objections to their Bill. One of two things will happen—either the Board will receive a severe snubbing from the Home Secretary, who may bring in a Bill to carry out his own ideas, to resist which the Board will be powerless; or the unfortunate people on the south side of the river will be exposed for another year to all the risks of damage and discomfort by floods.

It would appear that the Corporation of Liverpool are considering a scheme for taking fifty million gallons of water daily from the Vyrnwy, one of the feeders of the Severn. This has alarmed the Severn Conservators, who protest, and are anxious to know what amount of compensation water they are likely to get. It seems that only two hundred million gallons of water, in ordinary seasons, flow over Digby's Weir, between Shrewsbury and Worcester, and thus the abstraction of fifty million gallons above this point is a very serious matter. We do not know whether or not the Liverpool Town Council have decided on attempting to carry out this scheme, but if they have they are certain to meet with great opposition.

Speaking of Liverpool reminds us to call attention to a very interesting essay, by Mr. Parry, C.E., of that city, on Water Power in Liverpool. Few people reflect that the streams which flow silently under our streets are capable of being utilized to exert an enormous amount of mechanical power. They are so utilized to a small extent in the Metropolis. Hydraulic lifts, and hydraulic engines for organ-blowing, are not uncommon, but might be more extensively employed. The worst part of it is that the water used in this way is, for the most part, lost, and we have not in the Metropolis a sufficient supply to be able to spare much to drive machinery. Other cities and towns are, however, more favourably situated; and, with an abundant



supply of water, might be able to spare a good deal for mechanical purposes. Mr. Parry, of course, refers to that inexhaustible source of power the tides, which, when coal begins to fail us, will, no doubt, be made to do much of our work.

We refer once more, with some reluctance, to the Stockton and Middlesbrough purchase, for we do not like to exult over the unfortunate Corporations. Now that everything is accomplished, except the settlement of the inevitable bill, the promoters of the scheme begin to recriminate. It is alleged that at one period in the course of the negotiations a somewhat informal offer for the sale of the undertaking was made for the consideration of £550,000. This price, however, was considered too high by some members of the Committee, who were in attendance in London, and who objected to close the bargain without consulting the ratepayers. The parliamentary proceedings were, therefore, continued, with a result which our readers know. The ratepayers, who were not consulted, have now a heavy burden to sustain for some years to come. We are very sorry for them, and are only inclined to blame their representatives, who neglected to keep the last commandment, which says, "Thou shalt not covet thy neighbour's" goods.

Baron Norton, relieved from the cares of office, has time to devote to his own private affairs, and the first result is a letter to a Birmingham contemporary, complaining that an overflow of the Tame has flooded his meadows with Birmingham sewage, and completely spoilt his crop of grass, which is now worth nothing for mowing or pasture. This is bad news for the Corporation of Birmingham, who may perhaps hear something more of the matter. We have, at present, of course, only heard one side of the story. It may be shown that the mud deposited upon the noble lord's meadows was not contributed by Birmingham sewage, but was derived from quite a different source. We are given to understand that the sewage has, for a long time past, been most perfectly clarified; but it may be that, with an overwhelming amount of storm water running through the sewers into the tanks, the process of purification may not have been so complete as could have been desired. These accidents will probably always happen at times, until means are taken to separate storm water from sewage.

**SOCIÉTÉ TECHNIQUE DE L'INDUSTRIE DU GAZ EN FRANCE.**—The President has addressed a circular to the members, informing them that the meeting of the Society is fixed for the 24th of June and following days. The members of the British Association of Gas Managers who may be in Paris at that time are invited to be present. The Committee have decided to postpone until the 31st inst. the term previously fixed for sending in papers by candidates for the prizes already announced.

**SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.**—On the 9th inst. the quarterly meeting of the members of this Association was held at Harrow, when a paper was read by Mr. Brett, of the Hertford Gas Company, on "The Steam-Jet Exhauster." The number of Members present was 26, among whom were the Engineer of the Hastings, Tunbridge Wells, and of several of the Southern Gas Companies. The occasion of the meeting being held at Harrow was that Mr. John Chapman, one of the Directors of the Harrow Gas Company, had invited the Association to lunch with him; Mr. J. L. Chapman, his son, the Engineer of the Company being the Honorary Secretary. Luncheon was served at Mr. Chapman's house, after which the toast of "Success to the Southern Association of Gas Engineers" was given, and was responded to by Mr. Eldridge, Engineer to the Richmond Gas Company, and President of the Association for this year. The health of the host, Mr. Chapman, having been drunk, the Members separated, it being unanimously considered the most successful meeting that has been held since the formation of the Association.

**MALDEN GAS COMPANY AND THE TOWN COUNCIL.**—The Corporation of Malden have been erecting a new bridge, and in the course of the necessary operations the Gas Company have sustained a considerable loss by leakage from their mains, and have been put to expense in relaying pipes, for which also they claim compensation. At the meeting of the Town Council, on the 7th inst., the River and Bridges Committee reported that they had had presented to them by the Gas Company two claims—one for £50 for loss of gas alleged to have been occasioned through the negligence of the Contractor's servants, and the other for £45 12s. 8d. for taking up and re-laying mains; but after mature deliberation the Committee considered the Corporation were not liable to either claim, and recommended that they be not paid. On the report being brought up, an inquiry was made by a Member of the Council as to the reason why the Committee had come to such a conclusion. The Town Clerk replied that as to the £50 damage to pipes and loss of gas it was caused by the Contractor or his servants, and there was no doubt as to the law that damage caused by those persons could not render the Corporation liable. Then as to the £47: the Company laid the new pipes without orders from the Corporation, so it was very certain they could not be liable for them. In the course of a discussion which followed, it was urged strongly that some consideration was due to the Company, even if the Corporation were not liable, and that some compensation ought to be granted. The Mayor, however, explained that the Committee had taken the advice of their Clerk, who said they were not liable, and, that being the case, could not compensate, because they had no power to make the ratepayers pay gratuities. An amendment to the recommendation of the Committee was made, to the effect that the Gas Company be paid a fair and reasonable compensation for the loss they suffered in consequence of the necessity which arose for the old gas-main over the bridge being removed, and of their having had to lay a new main, and that in assessing the compensation it be taken into account that the Gas Company have a new main over the bridge instead of an old one. The amendment was lost by seven votes to four, and the original motion carried by seven to three.

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### THE TEMPERATURE OF GAS IN ASCENSION-PIPES.

SIR,—It is true, as Mr. R. O. Paterson remarks in his letter in your last JOURNAL, that the subject of the temperature of gas on leaving the retorts, as it is evolved from the coal, is deserving of more attention than it has hitherto received. The reflection is one which is applicable to the carbonization of coal generally, but I should hesitate to accept the inference which Mr. Paterson draws from the experiments he recounts.

If he will pursue the subject further, he will probably come to the conclusion that the temperature he found so near to the mouthpiece was not that of the issuing gas, but the heat from the retort, or the heat transmitted by conduction to the stand-pipe.

For instance, if a hole were made in the retort-lid, and the mercurial thermometer inserted, will it be doubted for a moment what the result would be? The instrument would be destroyed, of course, but it would be rash to infer that its destruction was due to the temperature of the gas rather than to that of the retort itself. The same reasoning applies to the ascension-pipe within a short distance of the mouthpiece; the intensity of the heat from any source varying, like the power of a luminous body, inversely as the square of the distance.

For the purpose of proving the truth or otherwise of the received opinions, I, this morning, asked my friend, Mr. Braddock, of the Manchester (Rochdale Road) Gas-Works, to apply a thermometer to the gas in the bridges at the top of a few of his ascension-pipes. This he did, with the result as follows:—

Experiment.	2 Cwt. Charges.	Temperature of the Gas.
No. 1 Retort charged	. . 1 hour	. . 135° Fahr.
No. 2       "       "	. . 3 hours	. . 116°   "
No. 3       "       "	. . 4½ "	. . 119°   "

The distance of the point where the thermometer was inserted to the mouthpiece averaged about 14 feet, and it will hardly be supposed that, within the short space named, the temperature of the gas could have fallen from above the boiling point of mercury, or over 652° Fahr., as stated by Mr. Paterson, to the rates which I have given, and especially when it is remembered that the temperature of the atmosphere over the bench was close on 100° at the time the trials were made. I venture this latter observation, having clearly in mind the researches of Dulong and Petit, who found that the rate of cooling is more rapid at high than at low temperatures.

Some further experiments directed to this question are in progress, the result of which I hope to communicate in a future letter.

THOMAS NEWSIGGING.

5, Norfolk Street, Manchester, May 18, 1873.

### HOW NOT TO DO IT.

SIR,—As extensions are a matter in which all Companies, large or small, are interested alike, I trust you will give me the opportunity of replying at some length to Mr. Stone's letter upon this subject, inserted in your JOURNAL of the 7th inst.

Your correspondent says:

1. "I should like to ask whether, in the event of the forecourt, garden, or open space being just within the 75 feet, the Company could not insist upon the meter being placed at that point, and not, perhaps, at 300 yards further distance, or even more, up a coach-road, or through gardens leading up to a residence?"

2. "Suppose a gentleman having a 'hunting-box,' approached by a carriage road a mile long, and the entrance gate being within 75 feet of the Company's main, I take it that the gentleman would be entitled to a supply of gas to his house if he consented to pay all the expenses beyond the carriage entrance, even though, only for the domestic apartments and passages, the revenue might not be more than £15. I cannot help thinking that the Company might insist upon fixing the meter at the point where their gratuitous duties cease—viz., 25 yards from their main."

3. "In my own case a Government establishment is desirous of having the meter placed at a point 300 yards from the main; but I am insisting upon it being placed at the end of the 25 yards."

4. "I know several towns, with small villas from £20 to £80 a year, built in their own grounds, where it would cost from 20s. to 40s. to put on the services. Possibly the gas in these villas might only be used for a few weeks in the year, in the summer season, so that it would be utterly impossible that the consumption would repay the outlay."

5. "Undoubtedly, for every additional 10,000 feet of gas sold we have to carbonize more coal, pay more wages, and, sooner or later, put up more retorts and gasholders. An increased rental and a diminished expenditure for coal may arise from several causes—perhaps improved manufacture and distributing plant, &c."

The clauses in the Act of 1871 relating to this matter are as follows:—

"Clause 11.—The Company shall give, and continue to give, a supply of gas . . . and shall furnish and lay down any pipes that may be necessary for that purpose (within 25 yards)—10 yards at their own expense, and 15 yards at the occupier's expense."

"Clause 14.—The undertakers shall supply to any such occupier a meter for registering the gas supplied by them."

"Clause 15.—No consumer shall connect or disconnect any such meter to or from any pipes through which gas is supplied . . . without giving the Company 24 hours notice."

I will answer these points in succession as I have numbered them:—

1. There is nothing in either of the Acts of 1847 and 1871, the only two public Acts which regulate the proceedings of Gas Companies, to authorize a Company to insist upon the meter being fixed at any place on a consumer's premises they think necessary. Under the Act of 1871, the Company are required to give, and continue to give, a supply of gas, to provide and lay down a service, and to furnish a meter for registering the gas. Some Companies fix the meters themselves, and regulate the meter-rent so as to cover the cost of fixing, while others merely supply the meter for the consumer himself to fix. If, then, a Company laid down the service and fixed the meter at the end, all their obligations would be fulfilled, and no one would have any right to interfere. If, however, a Company merely laid down the service and capped it, and furnished the meter for the consumer himself to fix, and the consumer fixed it in a position that the Company disapproved of, all



that the Company could do would be to prohibit him making any connection with the service; but then he could summon the Company before a Magistrate for refusing a supply, and the Magistrate, in the absence of any express statutory provisions upon the point, might think the Company were not justified, under the circumstances, in withholding the supply and inflict a penalty.

2. The occupier of the hunting-box would most certainly be entitled to demand a supply if he consented to pay the expense of everything beyond the first 30 feet, but not if he only consented to pay the expenses beyond the entrance gate. The objections to laying these long services, even when the consumer is willing to pay for them, is, I presume, the risk of loss by leakage, which the Companies think, and very properly too, ought to be borne by the consumer, and not by themselves, it being caused by a specialty incident to the consumer's premises, over which the Company can have no control. If this is the only objection—and it is the only one that I can think of—the difficulty seems, to my mind, to be more imaginary than real, and to arise from some mistaken idea that a service must of necessity be of wrought iron; but all the Act says is, "any pipe that may be necessary for that purpose." No Company would dream of laying down a mile of wrought-iron pipe, nor would any person, even for his own sake, wish them to do so. But a mile of cast-iron pipe might be laid in a gentleman's grounds as free from escapes as the fittings in his own house.

A Company, on being applied to in such a way, need only say, "This is not a case in which the ordinary wrought-iron pipe can be used with safety; it must be a small cast-iron pipe, and we are prepared to lay down such a pipe, and pay our portion whenever you are prepared to do the same."

A revenue of £15 a year in a house of this description would be worth consideration to any Gas Company, large or small, and it would pay a Company handsomely to incur an outlay of £50, or even £100, to secure it. To speak of the supply being *only* for the domestic offices and passages, is simply absurd. Gas once introduced into a house in the domestic offices soon finds its own way into the dwelling apartments, and if it does not mount to the bed-rooms in a very short time, there is but one way of accounting for it, and that is "bad gas."

A Company's gratuitous service ceases at 30 feet (not 75 feet); all beyond 30 feet has to be paid for by the consumer; consequently, if the meters were fixed at the end of the gratuitous service, they would sometimes be in the public thoroughfare.

3. This seems to be a case where the service was a 3-inch main, and, if so, the motive for insisting upon the meter being fixed at any particular spot is, in the absence of any explanation to the contrary, incomprehensible. It seems to have been wholly unnecessary for the protection of the Company, and, consequently, a vexatious and arbitrary proceeding. A Manager should, of course, make his Company safe before anything else; but having done that, he serves his Company best by giving the consumer every possible facility for carrying the gas all over his premises in any way he thinks fit.

4. The maximum dividend allowed to Gas Companies is 10 per cent. To pay this upon an outlay of 20s. or 40s. would require a profit of 2s. or 4s., as the case might be. How any Gas Manager could convince himself that the consumption in houses of this character would not be sufficient to pay this, is utterly inconceivable. Had any Local Authority said that the Gas Manager in his district had made such a statement, no gas man would have believed it. If this is a fair representation of the proceedings of Gas Managers in country districts, country gentlemen may well complain, as they now do, of the narrow views and vexatious restrictions of the country Companies. In estimating the probability of the consumption being remunerative, it is as easy and much more rational to assume that gas will be used freely in all parts of the house, as it is to assume that it will only be used for a short time in summer, and then very sparingly. It is not the duty of a Gas Manager to waste his time in these petty calculations as to the probability of each particular house being remunerative, and find obstacles to laying on the gas; but to sweep all obstacles out of his way, get the gas into every house, give an abundant supply and a good article, and rely upon the consumption, taking one house with the other, making an ample return upon all the outlay, however freely it may have been disbursed. No Manager who adopts this policy will ever find cause to regret it.

5. The remarks in my first letter upon this subject have been wrongly interpreted. I specially made use of the words, "within the compass of your plant," and these, in the reply, have been entirely lost sight of. The idea I wished to convey was this—that, while it is beyond doubt a Company supplying, say, 10,000,000 feet a year, with an increase of 1,000,000 feet, must carbonize more coal, and pay more wages; nevertheless, if the increase is only 50,000 or 100,000 feet, that additional quantity may, as likely as not, be provided without additional expense either for coals or wages. For instance, the quantity per ton of coals may in one year be only 9300 feet, but in the next 9500; and there are many ways in which the production may be affected; hence the folly of saying that for every additional 10,000 feet brought into the ledger, you have to carbonize more coal and pay more wages, or that the small consumptions are not remunerative. As I cannot help thinking that, if this point were clearly understood, many of these captious objections to laying on the gas would disappear, I will endeavour to explain it further in some other way.

The average profit of small Gas Companies may be taken at one-fourth of the gross receipts—that is to say, out of every £100 of gross receipts (gas, residuals, and everything else), £75 goes to working expenses, and £25 to profit. If this is taken as a standard at the termination of any financial year, and compared with the next, it will be found that for every £100 increase of rental the working expenses have only increased £25; but the profits have increased £75. The increase then becomes merged in the general account, and benefits that to some slight extent—say one-quarter or one-half per cent.—and this process goes on from year to year, until, after a series of years, it is found that the average profit has been increased by these extensions from 25 to 35 per cent., or even more. These proportions will, of course, only apply while all the circumstances remain the same. There might be, in the same time, an increase in the Directors' allowances, or in the Officers' salaries, or some other special circumstances to affect the

result; but, in the absence of all special circumstances, this, or something very much like it, will be the result, and any Manager can test it by his own operations.

The Metropolitan Gas Companies, under the Act of 1860, are required to send their accounts every year to the Board of Trade, and the Board lay them before Parliament, when they are printed and sold as a parliamentary paper. From these papers I have extracted the following particulars of the gross receipts from all sources and profits of the several Companies made collectively for the years 1861 and 1864:—

In 1861 the gross receipts were . . . . .	£1,751,980
And the profits were . . . . .	498,711
In 1864 the gross receipts were . . . . .	£2,090,752
And the profits were . . . . .	718,374

That is, in 1861 the profits were 28 per cent. of the gross receipts, and in 1864, 34½ per cent.

But the point to which I specially desire to direct attention, as illustrating this subject more forcibly than anything else, is this: Between the 31st of December, 1861, and the same day in 1864 (three years) the increase in the receipts was £338,772, and the increase in the profits £224,663, showing that the profits on the extensions were, within a very small fraction, two-thirds of the whole receipts. And this is by no means an exceptionally favourable result, as some of the Companies had reduced their price, and all of them had been put to large additional expenses to carry out the obligations imposed by the Act of 1860, and had made large allowances in other respects as well.

Some of the Companies accounts, individually, show results more favourable than this, and others less so; but this is the average of thirteen. If the figures could be worked out accurately, they would, in all probability, show a more favourable result for the average; but, even as it is, it ought to be sufficient to convince any one of the extreme folly of pursuing the mistaken policy of restricting the supply.

Sam Slick, when he first commenced trading in the clock line, in the backwoods of America, always took care, whenever he made a call, to have two clocks with him, and if he failed to sell one off-hand he asked permission, as the houses were far apart, to leave one until he came back, and this the parties supposing would either be that day or the next, always graciously permitted, when Sam put the clock in some conspicuous place, set it going, and departed. Instead, however, of going back the same day or the next, Sam never went back for six months, "calculating" that the parties would use the clock in the meanwhile, and so acquire the habit, and then be unwilling to part with it; and the result proved the correctness of his "calculations," for he never had but one to take back, and that was under very special circumstances. When he got to the end of his journey, he had only one clock left, and that was "pretty considerably" damaged; so he painted it up to look quite smart, and persuaded the last man he called upon to take it off his hands as a much better article, give him five dollars more, and allow him to bring the other away, which, having thus been paid for, Sam thought he might as well appropriate to his own use. Some time after, on being remonstrated with for selling a clock that would not go at all, Sam explained that, in telling the gentleman it was a better article, he had said "looking," though, perhaps, the gentleman had not heard him.

I do not presume to recommend the latter part of Sam's proceedings to Gas Managers, but I think some of them might take a hint from the former part. Get the gas into every house on the chance of the use of it becoming a habit, which the occupiers would not afterwards be willing to part with.

W. LIVESLY,  
Gas and Water Companies Association, 6, Victoria Street,  
Westminster, May 18, 1878.

#### AIR AS FUEL.

SIR,—With your permission, I should like to ask a question in reference to heating retorts. I have set a bed of four retorts, with the intention of trying to heat them partly by air. The plan I have adopted seems to answer very well, except that the furnace sides are burnt out so fast; and this is my difficulty. I can get a good heat with less fuel. I have a flue running the length of the retorts, by which I admit the cold air; it then travels back through another flue, and is admitted into the furnace, by which time it has become hot. I should like to know if any other manager has tried this or a similar process, and with what results. I should be glad also to hear, through the JOURNAL, any suggestions for getting over the difficulty I have mentioned.

J. W.

P.S.—I omitted to say that I have two air-flues, one on each side of the furnace.

#### THE SALES OF GAS ACT.

SIR,—Is it lawful for a Gas Company or Corporation, who have not adopted the Sales of Gas Act, to sell gas by meters which have not been stamped according to the Sales of Gas Act?

Are all towns and boroughs in the United Kingdom compelled to adopt the Sales of Gas Act, or is it optional for them to do so?

Can any Gas Company or Corporation, who have not adopted the Sales of Gas Act, clean and repair meters and use them again, without having them tested and re-stamped according to the Sales of Gas Act?

If any of my brother managers can name any Acts of Parliament bearing on the above questions, they will greatly oblige.

GAS MANAGER.

LEICESTER WATER-WORKS COMPANY.—A special meeting of Shareholders was held on the 13th inst., to sanction the Bill now before Parliament for the transfer of the undertaking of the Company to the Corporation. Mr. E. S. Ellis presided, and the heads of the Bill having been read over, he moved its approval, remarking that it had already passed the House of Lords, and the Shareholders had now, in accordance with the requirements of Parliament, an opportunity of considering again the terms which had been offered them by the Corporation for the purchase of their works, and they were at liberty, if they chose, of declining those terms, and of declaring the purchase to be at an end; but he did not apprehend that any such course would be taken. After some conversation on a minor point of detail, the Bill was approved. The Chairman, in responding to a vote of thanks, said there would be one more meeting to declare a dividend, and then they would probably not have occasion to meet again.



## Parliamentary Intelligence.

## HOUSE OF LORDS.

MONDAY, MAY 13.

The Chairman of Committees informed the House that the opposition to the South Staffordshire Water Bill was withdrawn.

The Examiners reported that the further Standing Orders applicable to the Scarborough Corporation Water Bill, and the Scarborough Water Bill, have been complied with; and that no further Standing Orders are applicable to the Limerick Corporation Gas Bill.

Lewes Gas Bill, Nottingham Improvement (Gas, &c.) Bill,—read a second time, and committed.

East Retford Borough Bill, Hamilton Burgh Bill, Hemel Hempstead District Gas Bill, Maryport Improvement Bill, Stoke-upon-Trent Corporation Gas Bill,—brought from the Commons, read the first time, and referred to the Examiners.

Petitions were presented against the Cardiff Water Bill, from the Corporation of Cardiff; and against the Limerick Corporation Gas Bill, from Merchants, traders, and ratepayers of Limerick.

TUESDAY, MAY 14.

The Chairman of Committees informed the House that the opposition to the Nottingham Improvement (Gas, &c.) Bill was withdrawn.

Truro Water Bill,—reported without amendment.

Lea Bridge District Gas Bill, Tredegar Water and Gas Bill, West Houghton Local Board Bill,—read a second time, and committed.

THURSDAY, MAY 16.

Dalton-in-Furness Local Board Bill,—reported with amendments.

Nottingham Water Bill,—reported without amendment.

West Houghton Local Board Bill,—reported with an amendment.

Limerick Corporation Gas Bill, Scarborough Corporation Water Bill, Scarborough Water Bill,—read a second time, and committed.

Manchester Corporation Water Bill, brought from the Commons, read the first time, and referred to the Examiners.

Public Health Act (1875) Amendment Bill,—brought from the Commons, and read the first time

FRIDAY, MAY 17.

The Examiners reported that the further Standing Orders applicable to the Hemel Hempstead District Gas Bill and the Stoke-upon-Trent Corporation Gas Bill have been complied with; that no further Standing Orders are applicable to the Hamilton Burgh Bill; and that the further proofs required by the Standing Orders Committee in respect of the South Staffordshire Water Bill have been given.

East Grinstead Gas and Water Bill, Mansfield Commissioners Gas Bill, South Hants Water Bill, South Staffordshire Water Bill,—reported with amendments.

Lea Bridge District Gas Bill, Lewes Gas Bill, Scarborough Water Bill,—reported without amendment.

Truro Water Bill,—read the third time, and passed.

## HOUSE OF COMMONS.

MONDAY, MAY 13.

Warrington Water Bill (Lords),—read a second time, and committed.

The Examiners reported that the Standing Orders not previously inquired into, and which are applicable thereto, have been complied with in the case of the Trowbridge Water Bill (Lords); and that the Standing Order which is applicable thereto has been complied with in the case of the Local Government Provisional Orders (Droitwich, &c.) Bill.

Metropolis Water-Works (Purchase) Bill,—adjourned debate on amendment on second reading further adjourned till Monday, May 20.

Gas and Water Orders Confirmation Bill,—read a second time, and committed.

TUESDAY, MAY 14.

Manchester Corporation Water Bill,—read the third time, and passed.

York United Gas Bill (Lords),—read the third time, and passed without amendment.

Weston-super-Mare Improvement Commissioners Bill,—as amended, considered; amendments made; to be read the third time.

Burton-upon-Trent Commissioners Bill (Lords), Clitheroe Gas, Water, and Improvement Bill (Lords),—reported with amendments.

The Examiners reported that the Standing Orders not previously inquired into have not been complied with in the case of the Leicester Corporation Bill.

Local Government Provisional Orders (Droitwich, &c.) Bill,—read a second time, and committed.

Public Health Act (1875) Amendment Bill,—as amended, considered; clause (power to require water-rates to be levied) added; to be read the third time.

WEDNESDAY, MAY 15.

Public Health Act (1875) Amendment Bill,—read the third time, and passed.

FRIDAY, MAY 17.

Bedlington Local Board Water Bill (Lords),—reported, with an amendment.

Radcliffe and Pilkington Gas Bill,—as amended, considered; to be read the third time.

Lichfield Gas Bill (Lords),—read the first time, and referred to the Examiners.

## HOUSE OF COMMONS COMMITTEES.

TUESDAY, MARCH 19.

(Before Mr. J. HOLME, Chairman; Mr. W. G. CARTWRIGHT, Mr. BARNE, and Mr. BOWEN; Mr. BONHAM-CARTER, Referee.)

## NOTTINGHAM WATER BILL.

## NOTTINGHAM IMPROVEMENT, GAS, AND WATER BILL.

Sir EDMUND BECKETT, Q.C., Mr. POPE, Q.C., and Mr. MICHAEL appeared for the Nottingham Water-Works Company, promoters of the first Bill, and in opposition to the second; Mr. BIDDER, Q.C., and Mr. VENABLES, Q.C., for the Corporation of Nottingham, promoters of the second Bill, and petitioners against the Bill of the Water Company. Mr. PEMBROKE STEPHENS also opposed the last named Bill on behalf of the Hucknall Local Board.

Sir E. BECKETT said: Sir, the Bill for which I appear, and which is promoted by the Nottingham Water-Works Company, is simply a Bill to enable that Company to raise more capital for the purpose of supplying a larger area with water than they do at present. The Bill is opposed by the Corporation, and the question which they raise in their petition was discussed and settled two or three years ago. There is another opposition from the Hucknall Local Board, of which I cannot speak in the

same way. One of the places we propose to include in our scheme is the township of Hucknall Torkard, which has a Local Board, and the people have come to the conclusion that we can supply them with water cheaper than they can supply themselves. The Corporation petition goes into the history of the Water Company, and therefore it is unnecessary for me to do so. It will be sufficient to begin with 1845, when the present Company were incorporated or re-incorporated out of one or two Companies that had previously existed for a considerable time. In 1845 the present Company were incorporated with a capital of £75,000, and with the right to pay a dividend of 10 per cent., as Water Companies generally have. You will see shortly why I emphasize this at the present moment. In 1854 a financial operation took place of a somewhat complicated kind, but which I think you will be easily able to understand. The Company wanted to increase their capital by £100,000, and it was arranged between them and the Corporation that this £75,000, which was capital receiving 10 per cent., should be increased to £150,000, bearing dividend after the rate of 5 per cent., being, of course, the same thing. I suppose the object of that was simplification, and inasmuch as the Company were willing to raise their new capital, limited to 5 per cent., it was simply to make that change with regard to the whole capital, and say that the capital of the Company should be £150,000, with a dividend of 5 per cent., instead of having two dividends, one of 10 per cent., and the other of 5 per cent. From that time all the capital has been raised at 5 per cent. We do not propose to alter this now, although the new capital is capable of bearing a dividend of 7 or 7½ per cent. At that time the Company volunteered to do another thing, which I confess I have not been able to see the wisdom of yet. They volunteered for some financial reasons of their own to sell all the new shares they were entitled to issue by Act of Parliament, by auction, instead of distributing them, as they were entitled to do under the Companies Clauses Act, among existing shareholders. It was the fashion in those days to sell new shares by auction, but I think the practice has been quite given up now, and I do not believe there is a single Company in England for supplying water under the obligation of issuing shares by auction. It has been several times attempted, but it has never succeeded, and of course we do not propose to do it now. We propose to give the public of Nottingham the benefit of raising new capital at 5 per cent., instead of 7 or 10 per cent. In carrying on the history of the Company, I next mention the Bill of 1869. In 1869 the Company were in want of more water, and they brought in a Bill for getting a supply from Dover Beck, in the neighbourhood of Nottingham. That was opposed by the landowners, among whom was the late Speaker, who gave evidence in favour of a friend of his, or tenant. The Company were enabled to make an extremely good bargain—I do not mean a pecuniary bargain, but an excellent sanitary bargain—for they were able to supply with good water such large places as Basford. Nottingham and the suburbs were increasing, as the area of large manufacturing towns do rapidly increase; and a further supply of water was needed. The Company, therefore, in that year completed arrangements with the Duke of St. Albans, to enable them to get a good supply of water from the red sandstone; and if the present Bill is passed we shall be able to get an equally good supply of water, and to take in such places as Greasley, Eastwood, Papplewick, and other important places in the district. There cannot be a much simpler case than this. We are supplying them because they wish to be supplied, and I have here memorials they have presented to us at different times. I desire only to refer particularly to the memorial from Hucknall, the inhabitants of which have had an interview with the Company, being represented by various influential people, and a discussion took place. Inasmuch as Hucknall has changed its mind, it is necessary I should call your attention to their memorial, dated Dec. 3, 1877, addressed to the Directors of the Nottingham Water-Works Company. The memorialists stated that they had learned with pleasure that it was the intention of the Company to apply to Parliament for powers to supply the parish with water, that they were satisfied the Company could supply them very much cheaper than they could supply themselves, and they took the opportunity of urging upon the Company the desirability of losing no time in bringing the supply to Hucknall. The memorial is signed by the Duke of Portland, who, I see, owns 2900 acres in the parish out of a little more than 3000 acres, and by many other people, owning among them a large number of houses. We had given notice of the Bill before receiving this memorial. This matter, however, has been greatly discussed for some time, and we knew the views of the people on the question. I suppose they sent this memorial because they knew there was opposition on the part of the Local Board, who wanted to supply the water themselves. In this case, then, we have the Local Board acting, not only against the wishes of the landowners, but against the householders of the place. We shall see presently whether the Local Board are wise in doing it or not. I desire to call particular attention to the fact that the owners of property at Hucknall are satisfied that we can supply them with water more cheaply than they can supply themselves. That was gone into at a meeting which took place, and a statement was made by one of the representatives, I think, of the Duke of Portland, that, even if we charged the maximum rate, we could do it for £950 a year. That is a matter of absolute certainty, whereas the estimates of the Local Board for these works—and every one knows how fallacious estimates are—were £1260, besides what they would have to charge from time to time. As to the necessity of supplying Hucknall with water, I need not enter into the question, because when two people are going to do the same thing, the necessity is assured. We have the means of supplying all the large places around, as well as Nottingham, with excellent water, not only as regards quantity, but quality. Returning, however, to the Corporation dispute, I may mention that, in 1874, the Corporation tried in the House of Lords, and also in the House of Commons, to get auction clauses imposed upon the Company, but failed. And I may add that not only did the Corporation of Nottingham fail, but many other Corporations have also failed in similar efforts. Among these are the Corporation of Sunderland, the Corporation of Liverpool, and the Corporation of Chesterfield. These applications were similar to the action of the Corporation of Nottingham in this case, and in every instance they failed to persuade Parliament to compel the Companies to sell shares by auction. Why, therefore, the Corporation of Nottingham should now try to obtain this power I do not know. The Corporation wanted to get possession of the Company's works, and there were ways and means of doing so, by offering such terms as were agreeable to the Company, but why they should get them by compulsion I am at a loss to understand. I do not remember that this has ever been sanctioned, with the exception of one case last year, where strong proof was given that the Company were not carrying out their undertaking satisfactorily, and where it was shown that they were unable to do so on account of the water being insufficient in quality, and this case was that of the Stockton and Middlesbrough Water Company. By an Act of 1866, that Company were enabled to take a limited quantity of water from the River Tees. In 1875 they desired to obtain powers for increasing that quantity, but this was objected to by those interested in the River Tees, their contention being that the water was required for purposes of navigation, and so on; and it was also objected to on the ground that the water of the Tees was not fit to drink. The Company had been before Parliament the year before with



exactly the same case, asking for power to get more water from the Tees, and the view taken of the case by Parliament was that, having already refused their application, the Corporation should have the power to buy the works at an arbitration price. The price at which the works should be acquired was fixed at 25 years purchase of the statutory dividend, and in addition to that it was referred to an arbitrator to fix a sum to be paid by the Corporations as compensation in the matter of future profits. In the matter of Nottingham, however, the case is directly opposed to this. The water supplied by the Nottingham Company is not only unimpeachable, but unimpeached; and this speaks even more strongly for it: in 1874 we challenged them in every way to produce any one from Nottingham who would find the slightest fault with the water in any way, as regarded the price, the quality, or the supply. The supply was constant, the water excellent, and the rates low. Among the witnesses examined at that time was an Alderman of the borough, whom I challenged to point out a single deficiency, and he was unable to do so; the only thing he could say was that the Corporation would like to have the water-works, as they thought they could make a good thing of them. No doubt they could if they got them at their own price, but I do not see why the Company are to be compelled to sell any more than any one else, unless at the price they freely agree upon; or why, indeed, they should part with their works by arbitration, unless it can be shown that such a course would be for the public good. While the supply is good and sufficient, I do not see why there should be any interference with the Company. I said all this with success in the year 1874 in both Houses of Parliament, and I shall be greatly surprised if I do not say it with the same success here, for no reason can be shown for deviating from the course already adopted. The Corporation cannot say that the auction clauses were imposed in 1854 by their proposition. I have read an account of the proceeding, and can only say that they were volunteered by the Company for purposes of their own. But if this had not been the case it would not signify, for since then Parliament has changed its mind, and has refused to impose the auction clauses on water companies. What is wanted to be done with this Company is, in short, to confiscate all further profits, and to annihilate the Companies Clauses Act, by which the shares are to be issued on such terms as the Company think fit. Now, if this proceeding is wrong, there should be a new Act to affect all Companies. It is also stated that the accounts filed by the Company are insufficient, and the Corporation state they are willing to purchase and carry on the water-works undertaking upon fair terms. They have offered us terms which we have refused to accept, and I cannot see why we should be bound to do so. Then with regard to the Bill to which the Corporation want to get the consent of Parliament. We are in conflict with them about the third part, the 11th clause of which really gives the Corporation power to step in at a favourable moment for themselves at any time within three years, and compel the Company to sell by arbitration.

Mr. VENABLES: That clause has been altered, and now the term is one year.

Sir E. BECKETT: If so, then the alteration gets rid of these remarks in detail; but there is the general objection. The clause is compulsory on both sides that the works shall be sold within a year at the arbitration price. As to precedents, there are one or two cases that I might mention and one in particular, that of Birmingham. Two or three years ago there was a Bill brought forward for the Corporation of Birmingham to buy the water-works. Some years previously the Corporation had agreed with the Company to sell the water-works. The Company, for some reason or other, offered to sell, but the Corporation for some time did not think fit to purchase; afterwards they wished to do it. Meanwhile the Company had extended their works, and for that reason and others the Corporation were told that it was no use filing a Bill in Chancery for the specific purposes of that agreement, for the Court could not decree. Therefore, as that could not be entertained, it was necessary to come to the Supreme Court of Equity, namely Parliament, to enforce the agreement volunteered years before. That was in 1876. The agreement had been made as long ago as 1851. It was an agreement of the Company to sell, with power to the Corporation to buy when they thought fit. In the House of Commons, for some reason, the Company withdrew and the Bill was unopposed, but the opposition was carried into the House of Lords, and they had to decide whether the agreement should be enforced or not. The Committee then expressed an opinion directly against the power of Corporations to purchase water-works compulsorily or by arbitration. This affords the strongest possible precedent for our case. With the exception of Stockton, my friend has not a single precedent in his favour, and that was sanctioned for the reasons I have stated. There is some objection to be made to the 12th clause, and the 13th is also to be objected to. As everybody knows, the general Act of Parliament put in force for the purpose of obtaining works of this kind is the Lands Clauses Act. Even in the case of Stockton, where such a very strong view was taken of the conduct of the Company, it was determined that the Lands Clauses Act was the one under which the proceedings should be carried out, and there were also certain sums to be stated by the arbitrator. In this case, however, the Corporation of Nottingham propose that the Railway Clauses Act shall be the one under which the value shall be determined. Now, under the Railway Act the costs of the arbitration, which are sometimes enormous, are to be paid as the arbitrator may direct, while under the Lands Clauses Act they have to be paid by the purchaser. Now, why should the costs be thrown upon us, or any portion of them? What have we done to deserve punishment? If we had done our work badly there might be some reason for this. An objection has also to be taken to the 24th clause, which in effect would give the Corporation a hold upon our annuities, leaving us to whistle for them. If the Company do part with the works to the Corporation, they ought to have some thoroughly good security upon the Corporation by means of the borough or district rate, or whatever they call it. I think I have now told the Committee all that it is necessary for me to state, and I will proceed to call witnesses in support of the Bill of the Company, proving the necessity for the extension of the district, and verifying and justifying what I have said.

Mr. Thomas Hawksley, examined by Mr. MICHAEL.

I am a Civil Engineer, and a Past President of the Institution of Civil Engineers. For many years I have had experience in water-works, and I have devoted a great deal of attention to those works. I was in 1830 appointed Engineer to the Nottingham Water Company. I constructed the works at that time. Those works were completed in 1831, and were the first I ever constructed on my own account. I have been Engineer of the undertaking ever since. I may say it is one of the finest water-works undertakings in the kingdom. It is now about ten times the size that it was originally. It has many country stations, and the district is traversed by miles and miles of pipes. The works originally for the supply of Nottingham were instituted about 1696. The supply of water was primarily obtained and continued for many years from the Leen, which runs at the lower side of the town. That continued till 1835 before any new works were undertaken, which was ultimately done because the Leen was becoming gradually polluted. During the period of the existence of the works Nottingham has increased in population from 7000 to about 40,000 inhabitants. In 1835 a Company made application to Parliament to become a Corporation for the purpose of obtaining

water, and getting their supply from the River Trent. They received incorporation in the following year. They did not carry out their works at once. They were unable to do so because of the commercial crisis at that time. In consequence the Company were unable to raise the necessary funds. The old Company, in 1827, obtained an Act of Incorporation. Subsequently the two Companies, as was usual at that period in such cases, carried on business in a manner that was very hostile. If water was laid on by one Company one day, there was a good chance that it would be cut off by the other Company the next day. That went on till 1845, when the amalgamation of the two Companies took place. I was appointed by both Companies to value their undertakings, and, in fact, to amalgamate them. They were amalgamated on the terms which I arranged, and an Act of Parliament was passed for the purpose. The capital was then fixed at £75,000, entitled to 10 per cent., with borrowing powers of £25,000, or a total capital of £100,000. At that time the Nottingham Enclosure Act came into operation, of which Act I was the chief promoter. In 1845 the Bill authorizing the enclosure of 1200 or 1400 acres of land was passed, which gave immediately five millions of money to the Nottingham Corporation, and as a consequence that quantity of land was immediately thrown open, as soon as the streets could be laid out, for building purposes. The result was that the Company were put to a very considerable expense indeed in piping and in pumping to a higher level to supply all this new town. There was a difference of opinion on the Board of Directors. Some who held old shares were desirous that the Company should not enter into larger additional expenditure, which would be prejudicial to the value of the old shares by a temporary reduction of the dividends. Others were quite willing to accept their position, and provide for the extensions. However, after very much debate between the two parties, one Director proposed, in order to raise the money at the least possible rate under the exigency of the case, that in the allotment of shares they should be sold by auction, and the premiums thus obtained should be put into the works without bearing dividends. That process came about in the way I have mentioned, and under the circumstances I have mentioned, immediately after the passing of the Act of 1845; and it continued as long as the Company's capital lasted—that is to say, till £75,000 had been laid out, and after that the Company were reduced to the necessity of making a further application to Parliament. In 1854 a Bill for that purpose was introduced. In the deposited Bill it was proposed to raise a further sum of £75,000, subject to a 10 per cent. dividend, all to be sold by auction, to be brought down to the current rate of interest of the day. The current rate of interest at that time was 4½ or 5 per cent. The step thus taken was not the result of any pressure put upon the Company by the Corporation. The process began years before that, and continued so long as there was any capital to sell. Of course the Company always meant to obtain a return for their money, and that afterwards they should be recouped, and their shares replaced upon the ordinary footing. That was in contemplation till about four years ago, when Parliament required us to continue the 5 per cent. allotment, but without any auction clauses. The shares were to be allotted in the usual way.

By the CHAIRMAN: In 1854 the Company duplicated their original capital of £75,000, which was entitled to 10 per cent., and converted it into £150,000 at 5 per cent. The Corporation did not oppose the Bill, but they interfered in a manner which I did not understand at that time, but I have since been able to surmise its meaning. The Corporation wished that there should be a statement in the Act that the maximum should be £2 10s. upon a £50 share—that is to say, that a dividend of 5 per cent. should be expressed. The Company had no objection to that, as it was, in fact, the purpose and object of their own proposition, and it was adopted. Upon that the Corporation said that it was at their dictation that the 5 per cent. limit was imposed. In 1874 it was proposed to increase the rate of interest which the Company might receive to 7 per cent., because it was thought the time had arrived when, by the success of their undertaking, they should have the usual reward of all their work, and they expected 7 per cent. upon their additional capital, but not upon the capital previously granted—that being the usual rate of dividend, in other water-works, upon new capital. The Bill came on in the House of Lords, and was opposed by the Corporation. It passed that House, and was even more intently opposed in the Commons. The Bill, however, was practically passed as proposed by the Company, except that 5 per cent. dividend was fixed instead of 7 per cent. The Company accepted the restriction of both Houses of Parliament, and now ask for capital at 5 per cent., not seeking to alter it. We propose to raise further capital entitled to a dividend of 5 per cent. only, but not subject to the auction clauses to which we are not now subject, and I believe there is not one Water Company who are subject to auction clauses. The rate of 5 per cent. is also exceptional.

Examination continued: This Company were the first to attain the condition of a high-pressure supply; and not only have we done that, but we have continued it absolutely without cessation from 1831 till the present time. The Nottingham Company have been the cause of the spread of that system all over the kingdom. The quality of the water is very beautiful, chiefly obtained from the red sandstone strata, and it is lifted to various heights, so that we are able to supply the whole of the district with water at high pressure. Practically, the water is never off at all. People use it *ad libitum* day and night. There is no restriction at all to its use. The rates are very moderate indeed. I do not think they are quite the lowest, but they are very nearly the lowest of any town in the kingdom. We supply all manufacturers, and all demands for sanitary purposes. For a house of the annual value of £5, the charge would be 4s. 8d. a year, or a little more than a penny a week—i.e., for a penny a week about five persons are supplied with water. That is a constant supply at high pressure. In Rochdale the charge is 7s. 6d.; in Birmingham it is 6s.; in Bury and Bradford it is 7s. 6d.; in Oldham it is 6s. 8d.; in Bolton it is 7s. 6d.; and so on.

By the CHAIRMAN: The highest is Sheffield, at 8s. 11½d. I will take a house at £10 annual value. Our rate is 11s.; Rochdale, £1; Birmingham, 10s.; Bury, 15s.; Heywood, 15s.; Bradford, 15s.; Oldham, 13s. 4d.; Bolton, 12s. 8d.; and Sheffield is 15s. In that case I think Rochdale is the highest. The rates under different Acts of Parliament are not at all consistent with each other. At Manchester the charge is 7s. 6d.

Examination resumed: Many towns where the Corporations have the water supply in hand have public rates in addition. The 7s. 6d. in Manchester is equivalent to an outlay of 5d. in the pound, because it is levied on all properties alike; whereas the Company can only levy upon house property. I cannot give you the exact amount, because there is a difference between the rate and the value. I suppose the Manchester rate would be equal to about 11s. 6d. The rest are valued in about the same proportion, but you will see that as the scale extends we are lower in proportion than in the cases I have already quoted. We have also commenced in the class of small houses, and have extended the system somewhat on a larger scale, by making an allowance to the landlord for payment in the gross. We also provide the houses with communication-pipes at our own expense. It was this Company who established that system, which has been only partially applied in a very few other towns. This Company have also erected 1500 hydrants in various parts of the district at a cost of about £6000. We further keep a large staff of people for our own benefit and that of our customers, to look after the taps both external and internal, and we



maintain them in repair till they are utterly worn out. We have six stations at the present time, and we have four reservoirs—two at the sources. We have four high-level reservoirs, eight steam-engines, and a water-engine. The sources of our present supply are all deep wells sunk in the sandstone formation; but we have also to take water from the River Trent. The last right we do not exercise, and have not exercised for many years. Our present capabilities of supply amount to 7 million gallons per day. The requirements I average at a maximum of 4 million gallons, going down to nearly 3. Practically, there is a capability of 6 million gallons, for there must always be a margin left, as against requirements of 4 millions. In the district we supply there are 32,000 or 33,000 houses, with others in course of erection, so that it would not be unfair to estimate the population at 170,000 persons. We have 106 or 107 miles of mains. We have never refused to supply any district, nor, as far as I know, any house. We always anticipate the wants of the districts as much as possible, and lay down mains in the streets before the houses are built. Our income is £35,500 a year, and our debt now is £6000; but I hope that will be paid off on March 25, 1880. The amount of capital raised by premiums on shares alone is £28,000. Then the ancient Company accumulated a great deal of property, chiefly land, and that is worth within a few pounds of £25,000. That, added to the £28,000, would give £53,000 of capital not bearing interest. Altogether there is about £78,000 in the undertaking not bearing interest. The district which we seek to supply has a population of about 32,000. Our pipes go up to the borders of Hucknall. Nottingham is as dependent upon them as they are upon Nottingham, and as we are private capitalists, having a right to supply water, we propose to give these places the blessing of an ample supply. There is no other supply but from the red sandstone, and we practically hold the key in that respect. We have large works already at Bestwood, and we have a high-pressure reservoir, called the Red Hill Service Reservoir. By an arrangement with the Duke of St. Albans, we have a right to the whole of the water in the large sandstone district—about 5000 acres around Arnold. We have also the right to take water from several thousand acres, which are distinguished on the map as Linby and Papplewick. We have no works there at present, nor shall we have, I suppose, unless this Bill is passed. From that district we can obtain an additional 3 million gallons of water. The proposed additional works would be beyond Papplewick, and it is proposed to bring water from that source for the supply of New Brinsley, Brinsley, Eastwood, Greasley, Newthorpe, Kimberley, and so on, and for us to do that it would not take more than a month. When the new lines are made they will naturally travel through Hucknall. We could avoid it, but the natural road is through Hucknall; and Mr. Montague, who is one of the large proprietors of land in this district, has arranged with us for the direct road to the places we propose to supply. He is in favour of our scheme, and opposes that of Hucknall to supply itself with water. Our scheme provides for a natural extension of our area for the good of the community. The rateable value of the rents is lower in this district than in Nottingham, and, therefore, we shall add 25 per cent. to the rates, and no one objects, or raises an objection to it. There is nothing in the petition of the Corporation but a desire to become possessors, compulsorily, of the undertaking of the Company. We have never given them any cause of complaint in any way; but ours is one of the finest investments, and one of the best conducted water-works in the kingdom, and that cannot and will not be denied.

Cross-examination by Mr. BIDDER: In only one case has Parliament sanctioned the compulsory transfer of water-works, and that was hardly a case of compulsion, because negotiations had proceeded between the Company and the Corporations previously. I refer to the case of Stockton and Middlesbrough.

Mr. BIDDER: I was one of the Counsel in that case, and remember it well. Do you mean to suggest that there was no compulsory purchase?

Witness: It was a compulsory purchase, but it was not compulsory in the ordinary sense of the word, because the parties had been in negotiation, and ultimately there was a *quasi* willing vendor.

Cross-examination continued: The Nottingham Company do not pay a very high rate of dividend; they do not pay one shilling more than Parliament has sanctioned. They do not always pay maximum dividends. They are now paying up about £6000 of arrears. The Company have been going on steadily and gradually for some years past increasing about £2500 a year, on the average, and there has been a steady growth of the mains in the district. In 1854 we obtained leave to raise £100,000 new capital for the general purposes of the undertaking, and that capital was spent very carefully and economically, and lasted about 20 years. In 1868 we again applied, but failed, and in 1873 we came for extended powers and £25,000. We asked for 7 per cent. on that capital, which is the same as is allowed to other water companies. The Corporation opposed us, and Parliament did not grant it. In 1874 we applied for £100,000, which we thought would meet our immediate wants. We again asked for 7 per cent., and the Corporation opposed, desiring to cut down our dividend to 5 per cent., and in that they succeeded. At that time I estimated that the £100,000 would last us for 16 or 20 years. That money has been expended, and I can tell you where it has gone to exactly. I was wrong in estimating it would last so long. I was then looking into the middle of next week, whereas I am now looking into the middle of last week. I was looking then into the future, with all its uncertainties; but now I am looking into the past, with all its certainties. Whether I was right or wrong is quite immaterial if the money has been properly, and usefully, and beneficially expended, as I am prepared to show it has been. In a very few months after the Company obtained the money they allotted the shares. £19 5s. shares issued and called up are worth now in the market about £28 10s. or £29. That is to say they are now at about 50 per cent. premium.

Mr. BIDDER: Therefore have not the Shareholders, in consequence of obtaining this £100,000, put into their pockets £50,000?

Witness: They have not taken it out of anybody else's pocket.

Mr. BIDDER: In point of fact, the premiums have reached about £17,000 a year?

Witness: You call it premium; well, I will call it bonus or windfall. The additional sum should not come out of the pockets of the ratepayers, but out of the market, with which the ratepayers had nothing to do. If I choose to give you for certain shares 40 or 50 per cent. premium, it is a matter between ourselves, and the Corporation have nothing to do with it.

Cross-examination continued: The maximum dividends amount to about £18,000 per annum. The greater part of the £100,000 has gone in paying off bonds and debts. I cannot tell whether the Company have any unexercised power of raising money on debentures. The power to raise £25,000, under the Act of 1874, was not by debentures but by loans. The 12th section gives them power to borrow upon mortgage any sum not exceeding £25,000, but that is different from raising money upon debenture stock, which is in the nature of shares to which a particular kind of preference is attached. That is saleable in the market, and may be sold from hand to hand for a profit price. We have raised money by borrowing; even during the past year £9000 has been borrowed under the general powers of the Company. I can form no idea how long the £150,000 now asked for will last. I am not going to prophesy again; having failed once,

I am not going to guarantee anything in this world again. The new districts will cost about £60,000. We shall not have to spend any considerable amount in erecting any additional pumping-station for some time, because the one at Bestwood is competent for the supply of the new district for years. In that respect my prophecy was right. I cannot tell you how many years it will be, but we shall have, by and by, to erect a new pumping-station on Mr. Montague's land. We have acquired a site of about 10 acres for that purpose. I can tell you that not one farthing of the Company's money has been spent otherwise than profitably. As to the additional capital being a godsend to the Shareholders to the extent of £75,000, that depends on the value. If the money were expended—and it never would be except usefully—it might get up to that.

Mr. BIDDER: It has got up to that rate in the other cases already.

Witness: Because there have been causes, and I hope there always will be. There will be more people to take the water, and therefore more to pay. They are increasing by thousands, and all these mouths must be filled. I think it likely we may hereafter have to come to Parliament for another £150,000.

Cross-examination continued: I am informed that the last raised capital has all been expended with the exception of about £3000. We have supplied three districts, including Beeston and Arnold, and we have paid off some loans and a large amount of debt. I am perfectly sure that the money has all gone in a perfectly legitimate way. The figures produced refer to the expenditure of the money during three years. With regard to the £28,000 for mains, the mains for the supply from the Red Hill reservoir were laid, and the work was in progress, in 1874. I cannot tell you how much has been spent on the works since 1874. We have still power to raise £39,300 on mortgage, and we can raise money on superfluous land, but that bordering the Trent would have to be brought into the market as building land in small proportions. It might in reality be worth £25,000, but it is not practicable at present to force it into the market. We might raise £40,000 on debentures to-morrow, if we chose to get heavily into debt, instead of on shares; but we have a natural repugnance to mortgage debts, and when we are obliged to resort to them we do it unwillingly. The shares of any company always sell better in the market when there is not a large claim in the shape of mortgages. We mean to raise the money we are authorized to raise on mortgage, by the Act of 1874, if occasion requires, but by preference we should like to raise it by shares, thus to have all the people holding claims upon the profit rowing in the same boat. My advice has always been, never get into debt if you can help it. As a matter of preference I should say that I would rather raise money by share capital. I have no means of answering whether, if Parliament grants us the additional share capital now asked for, we shall not exercise the borrowing powers of the Act of 1874; that would be my view of the matter, but I am not the Company.

By Mr. STEPHENS: The extensions proposed by this Bill will nearly double the area of the Company's operations, and for the new area a differential rate of 25 per cent. is proposed, but that is not 25 per cent. more than is being paid in Nottingham. The rate is levied according to the rent of the house, and a £12 house in Nottingham would not be worth more than £8 in these outlying districts, consequently the rate would not be higher either per head or per house. I attach much importance to the supply of Hucknall Torkard. There are 8000 people there, and our pipes go through it, or alongside it. The area of Hucknall is 3200 acres, of which 2900 belong to the Duke of Portland. We could supply it in a month. The idea of taking in Hucknall must have been in the minds of the Company for a couple of years. We were in Parliament in 1874 for an extension of limits, and we proposed then to take in Hucknall, but something occurred in the town of Nottingham which induced the Board to strike out a number of the places. I cannot say that the Company deliberately abandoned this scheme, nor can I give their reasons for doing it. I know, however, that a letter was written to the Parliamentary Agent to withdraw these places from the Bill.

Mr. MICHAEL: I believe they were in the parliamentary notice, but not in the Bill as deposited.

Witness: I think that was the case. There are two additional works required for the supply of Hucknall, but a tenth of the cost of getting the water from the Red Hill reservoir ought to fall upon Hucknall in proportion to the supply. The supply of Hucknall would be as valuable to the Company in the matter of service, as Parliament Street might be to Charing Cross. Water Companies have the right of laying pipes along any public highway in their districts. Our direct road is through the heart of the village. With regard to the basin of which mention has been made, there were many people to be consulted before an agreement could be come to between Mr. Montague and the Water Company, and the agreement produced which refers to the matter is a private one of Mr. Montague's. Several years ago I made a survey of the Hucknall district, and recommended a source of supply upon Mr. Montague's estate. That was as far as the matter proceeded. There were no negotiations with Mr. Montague so far as I am aware. A new idea, suggested by the Local Government Board of that day, was broached, to the effect that there should be a combined district, consisting of Hucknall, Bulwell, Greasley, and Eastwood, for the purposes of water supply, but that also fell through. In July, 1874, I saw no violent impropriety in Hucknall getting a supply for itself by pumping on Mr. Montague's estate, for they must get it from somewhere, and there was then, in my opinion, no other service open to them. But what was right and proper—and even necessary—under the then circumstances, is becoming wrong and improper under existing circumstances. We care so little about Hucknall *per se*, that you might cast it out and do us no harm, but it lies in the direct line to Eastwood, and our pipes going there we can, with our large undertaking, supply them better than they can possibly supply themselves with their small undertaking. An agreement has been entered into, by which a rate is to be paid to Mr. Montague for the use we shall make of his estate. Unless we get these powers within five years the agreement falls through, but we have to pay the rate for the time, and in perpetuity if the Bill is carried.

(To be continued.)

FRIDAY, MAY 10.

(Before Mr. RAIKES, Chairman of Ways and Means; Mr. HARDCASTLE; and Mr. RICKARDS, Referee.)

RADCLIFFE AND PILKINGTON GAS BILL.

This was an unopposed Bill, and the Committee reported as follows to the House:—

"The Bill empowers the Company to acquire additional lands for the purpose of extending and enlarging their gas-works, and to raise further moneys in order to meet the increased demands for gas within their authorized limits of supply.

"This Company is in an exceptional position. Its district is of great area, and for the most part sparsely populated. Its outlay is comparatively large, and its income comparatively small. Moreover, in consequence of extensive mining operations, the loss of gas by leakage is very considerable. The dividends of the Company have of late years been greatly reduced, and have been subject to many fluctuations, whereby the value of the share property has been detrimentally affected. The



dividend upon the larger portion of the present capital of the Company is limited by the Act authorizing such capital to 7 per cent., and the dividend upon the whole of the new capital of £120,000 is limited by the Bill to the same rate. Under these circumstances the Committee are of opinion that the requirements of Standing Order No. 183a will be sufficiently met by requiring the sale by auction or tender of £80,000 of such new capital, and they have made provision in the Bill accordingly.

"The Committee have examined the allegations of the Bill, and found the same to be true, and have gone through the Bill, and made amendments thereunto."

(Before Mr. RAIKES, Chairman of Ways and Means; Mr. STACPOOLE; and Mr. RICKARDS, Referee.)

YORK UNITED GAS BILL (LORDS).  
Messrs. DYSON and Co. appeared as Agents for this Bill, which has passed the House of Lords, and now came before the Committee as an unopposed measure.

In the course of the proceedings,  
Mr. RICKARDS asked: To what interest is the new capital limited?  
The AGENT: Five per cent.  
The CHAIRMAN: What is the meaning of clause 21?  
The AGENT: It debars the Company from converting borrowed money into capital. The clause was inserted at the suggestion of the Corporation, who were afraid something of the kind might be done.  
Mr. RICKARDS: What is your present price for gas?  
The AGENT: Two shillings and sixpence, and we find we cannot live at that.

The CHAIRMAN: The price is much lower than that charged by other Companies?  
The AGENT: Yes.  
The CHAIRMAN: Well, we allow the Bill to pass through, and shall in our report mention that the price charged is very low.

The following is the report of the Committee to the House:—  
"The Bill empowers the Company to enlarge their gas-works, to extend their district of supply, and to raise £80,000 additional capital.  
"The dividend on such additional capital is limited by the Bill to 5 per cent. per annum, and the Committee therefore have not thought it necessary to introduce a provision for the offer of such capital by public auction or tender.  
"They have examined the allegations of the Bill, and found the same to be true, and have gone through the Bill, and directed the Chairman to report the same without amendment."

Miscellaneous News.

METROPOLIS GAS SUPPLY.  
Dr. Whitmore's report on the illuminating power, pressure, and quality of the coal gas consumed in the parish of Marylebone, and supplied by The Gaslight and Coke Company, during April:—

	Illuminating Power in Sperm Candles.			Mean Pressure in Tenth of an Inch.		Mean Quantity of Sulphur in 100 Cu. Ft.		Mean Quantity of Ammonia in 100 Cu. Ft.		Sulphuretted Hydrogen.
	*Mean of 22 Obser.	High-est.	Low-est.	High-est.	Low-est.	Grains.	Grains.	Grains.	Grains.	
Gas supplied from the Fulham works . . . . .	16.87	17.31	16.2	18.82	9.64	17.26	0.26	No trace		
Gas supplied from the Beckton and Bow works . . . . .	16.73	17.34	16.31	40.42	19.28	13.16	0.26	No trace		
Cannel gas supplied from the Pimlico works . . . . .	20.96	22.03	20.02	22.00	12.97	13.03	0.06	No trace		

Mean of daily readings of barometer . . . . . 29.60  
" " " " thermometer . . . . . 61.46

\* Each observation consists of ten readings of the photometer, at intervals of one minute.

The mean illuminating power of all the three gases supplied to the parish during the month was very nearly a candle in excess of the standard, and on no occasion did either of them fall below it, whilst on several occasions the excess was from a candle and a half to two candles. The mean quantity of sulphur found in 100 cubic feet of the gas supplied from Fulham was about 17 grains; in the other two gases it was only about 13 grains, whilst as regards ammonia it was virtually nil. The pressure was generally satisfactory, and on no occasion was sulphuretted hydrogen detected in either of the gases by the ordinary tests. It is only fair to state that the gas supplied to this parish, during the past month, was unusually good, both as regards illuminating power and freedom from impurity.

Dr. Stevenson's report on the gas supplied by The Gaslight and Coke Company to the Vestry of St. Pancras, during the month of April, 1878:—  
Maximum light estimated by sperm candles, according to the Act—18.5.  
Minimum light, sperm candles—16.6. Average light, sperm candles—17.2.  
Traces of ammonia, indicated by turmeric test paper—Traces on all occasions. Traces of sulphuretted hydrogen, indicated by lead test paper—None on any occasion. Sulphur 14.5 grains per 100 cubic feet.

METROPOLIS WATER SUPPLY.  
THE ABORTIVE SCHEMES OF THE METROPOLITAN BOARD.—On Friday last a deputation conveyed the thanks of the Vestry of St. Pancras to Sir Thomas Chambers, at the hall of the Middle Temple, for the services he had rendered by his opposition to the proposal for transferring the water-works of the Metropolis to the jurisdiction of the Metropolitan Board of Works.

Dr. Frankland reports as the result of his analyses of the waters supplied to the Metropolis and some of its suburbs during April, that taking the average amount of organic impurity in a given volume of the Kent Company's water during the nine years, ending December, 1876, to represent unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies was—Colne Valley 1.3, Kent 1.3, New River 1.7, East London 2.7, West Middlesex 3.0, Lambeth 3.1, Grand Junction 3.1, Southwark 3.8, and Chelsea 3.8. The water abstracted from the Thames and Lea, by seven out of the eight Companies supplying the inner circle, exhibited a marked improvement when compared with the corresponding samples collected in March. It was also in all cases efficiently filtered before delivery. The water supplied by the Kent and Colne Valley Companies was bright, wholesome, palatable, and of its usual excellent quality. The softest water supplied by other Companies was three times as hard as that delivered by the Colne Valley

Company. Seen through a stratum 2 feet deep, the water supplied by the Kent and Colne Valley Companies, was clear and colourless; the New River Company's water was clear and nearly colourless; that delivered by the Chelsea, West Middlesex, Southwark, Lambeth, and East London Companies, clear and very pale yellow; and that by the Grand Junction Company, clear and very pale yellowish brown.

Results of Analysis expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Mat- ters.	Or- ganic Car- bon.	Or- ganic Nitro- gen.	Ammonia.	Nitrogen, as Ni- trates and Nitrites.	Total combined Nitro- gen.	Chlo- rine.	Total Hard- ness.
Inner Circle.								
Thames—								
Chelsea . . . . .	26.74	.188	.036	0	.206	.242	1.5	20.6
West Middlesex . . . . .	25.62	.142	.034	0	.230	.364	1.6	21.2
Southwark and Vauxhall . . . . .	26.10	.176	.046	0	.219	.265	1.5	20.6
Grand Junction . . . . .	26.82	.145	.037	0	.201	.238	1.5	20.6
Lambeth . . . . .	28.06	.152	.028	0	.163	.191	1.6	20.6
Other Sources—								
New River . . . . .	25.12	.072	.028	0	.288	.316	1.6	20.0
East London . . . . .	30.18	.128	.030	0	.245	.275	1.8	21.2
Kent . . . . .	38.92	.059	.019	0	.464	.483	2.5	27.8
Outer Circle.								
Colne Valley . . . . .	13.94	.054	.021	0	.346	.357	1.4	6.7
Tottenham Local Board . . . . .	—	—	—	0	—	—	—	—
Corporation of Birming- ham* . . . . .	24.30	.303	.047	.002	.321	.369	1.9	13.8
Corporation of Glasgow† . . . . .	3.20	.130	.020	0	.005	.025	0.55	1.27

\* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.  
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.  
Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

The Registrar-General publishes the following returns of the average daily quantity of water supplied by the London Water Companies during the month of April. According to these, 118,335,458 gallons, or 537,652 cubic metres of water (equal to about as many tons by measure, tons by weight) were supplied daily; or 217 gallons (98.6 decalitres), rather less than a ton by weight, to each house, and 30.6 gallons (13.9 decalitres) to each person, against 29.9 gallons during April, 1877.

COMPANIES.	Number of Houses, &c., supplied in		Aver. Daily Supply of Water in Gallons* during	
	April, 1877.	April, 1878.	April, 1877.	April, 1878.
Total supply . . . . .	582,166	544,381	118,059,770	118,335,458
From Thames . . . . .	249,548	256,903	57,103,563	59,302,563
„ Lea and other Sources . . . . .	262,618	237,478	55,956,207	59,032,890
THAMES.				
Chelsea . . . . .	28,741	29,014	7,163,300	8,132,300
West Middlesex . . . . .	49,035	50,562	9,814,214	9,300,265
Southwark and Vauxhall . . . . .	77,380	80,375	17,250,000	18,200,000
Grand Junction . . . . .	37,683	38,462	10,815,019	10,693,898
Lambeth . . . . .	56,209	58,490	12,061,000	12,926,100
LEA AND OTHER SOURCES.				
New River . . . . .	125,219	126,563	24,368,000	26,315,000
East London . . . . .	111,967	115,143	24,908,780	25,576,590
Kent . . . . .	45,432	45,772	6,679,427	7,141,300

\* Including that for manufactures and for various purposes other than for domestic consumption.  
Note.—The return for April, 1878, as compared with that for the corresponding month of 1877, shows an increase of 12,215 houses, and of 5,275,688 gallons of water supplied daily.

Dr. Whitmore's report on the composition of Thames Companies and other waters consumed in Marylebone during April:—

	In Grains, per Gallon.		In Parts, per Million.		In Degrees.	
	Total Solid Matter.	Loss by Incineration.*	Chlo- rine.	Free Ammo- nia.	Albume- noid Ammo- nia.	Hard- ness after boil- ing Fifteen Minutes.
West Middlesex . . . . .	18.00	0.80	1.08	0.02	0.06	12.4
Grand Junction . . . . .	20.10	0.90	1.06	0.01	0.08	13.8

\* The loss by incineration represents the amount of organic and other volatile matters contained in the Imperial gallon (70,000 grains) of water. The total solid matter, minus such loss, consisted largely of carbonate of lime, with small quantities of other equally harmless salts.

The water of both Companies, as drawn from the mains, when seen through a stratum of two feet in thickness, was clear and bright, and no living organisms were detected in either by the microscope. The water as taken from the Thames at Hampton, the point of intake of both the above Companies, was only slightly turbid. In this water living and moving organisms were found.

WIMBLEDON PUBLIC LIGHTING.—At the meeting of the Wimbledon Local Board on the 15th inst., a letter was read from the Mitcham Gas Company, in which they undertook to light 265 public lamps from the 1st of June next to the 31st of May, 1879, inclusive, at £5 2s. 6d. per lamp, and from the 1st of August next to the 31st of May, 1879, at £4 5s. 6d., the times of lighting, extinguishing, and other conditions to be the same as at present. This is a reduction of 4s. 6d. per lamp upon the existing terms. It was resolved that a contract for the ten months be entered into with the Company.

UCKFIELD GAS COMPANY.—The annual meeting was held on the 3rd inst. The balance-sheet showed that the amount received from private consumers for gas-rental had continued to steadily increase, the income from that source for the year just ended being £852 10s. 4d., against £789 19s. 10d. in the previous year. There had been received for coke and tar £119 2s. 9d. This was less than in the previous year, owing to the mildness of the past winter affecting the price of fuel. The Directors had paid off during the year half of the debenture loan—viz., £200—leaving £200 still owing on that account. There was a balance, after providing for the amount owing on debentures, and interest, of £483 5s. 8d. available for dividend and reserve. It was resolved to appropriate £200 of this balance in payment of a dividend, at the rate of 10 per cent., to the Shareholders, leaving sufficient in hand to pay for the year's supply of coals, and so form a reserve.



## ROCHDALE CORPORATION GAS-WORKS.

## REPORT OF THE GAS COMMITTEE.

To the Council of the Borough of Rochdale.

The Gas Committee present the following report on their department for the year ending March 25, 1878.

Notwithstanding the reduction made in the price of gas last year, equivalent in the aggregate to over £4000 per annum, your Committee are pleased to inform you that, in consequence of more favourable coal contracts, and by a more careful supervision exercised over the manufacturing department, the profits during the past year are the largest that have ever been realized. After paying interest and 1-75th part of debt, and all other liabilities, the surplus profits amount to £8622 9s. 2½d.

The coke receipts are about the same this year as last. The per centage of coke sold is 37 per cent. of the material carbonized; last year being 33 per cent.

Your Committee have not thought it wise during the past winter to work the hydraulic stoking machinery, in consequence of two-thirds of the retorts then in use being of small size. Renewals are now being made, and when completed, all retorts will be of the size required for the successful working by machinery.

Considerable expense has been incurred during the year by the failure of one of the gasholder-tanks, which required considerable alterations to be made in the construction, in order to prevent the recurrence of a similar accident. The tank is now satisfactory, and all expenses connected therewith have been charged to revenue account.

The new governor-house and offices are now nearly completed, the station-governors placed in position, and the connecting-mains are now being laid. The respective governors will supply respective districts, and thus give a more perfect control over the total area of supply than has hitherto been attained.

It is the intention of your Committee, during this year, to replace the No. 1 station-meter with one of a larger capacity, as it is proved that the present means of registering the gas manufactured in winter is unreliable.

The following brief summary represents a comparative view of the working for the year ending March 25, 1878, and March 31, 1877, viz.:-

	Cubic Feet.
Gas made this year to the 25th of March. No. 1 station-meter registering	—
Gas made last year to the 31st of March	—
Decrease	219,577,900
Gas sold and used this year	221,391,000
Ditto last year	—
Decrease	1,813,100
Value of gas sold, after deducting discounts, this year	£43,297 15 11½
Ditto ditto last year	47,435 4 3½
Decrease	£4,137 8 4
The profits this year amount to	£8,622 9 2½
Ditto last year amounted to	6,903 1 6½
Increase	£1,719 7 8
The present number of consumers is	19,312
Last year the number of consumers was	18,550
Increase	762
New lamp services laid this year	21
Making total new services laid this year	783
2672 yards of new and additional main-pipes have been laid during the	—
past year in various roads and streets, at a cost of	£1,368 17 9
The services referred to above cost	394 8 0
Extensions on works during year	2,261 15 6
Making total amount chargeable to capital	£4,025 1 3

The following statements give the size and number of meters in use, the quarterly and annual average illuminating power and purity of gas supplied during the past year, also the maximum and minimum tests each quarter.

## Number and Size of Wet Meters in use up to March 25, 1878.

Lights No.	2	3	5	10	15	20	30	50	60	80
Meters No.	15098	1333	858	391	17	132	84	65	1	36

## Number and Size of Wet Meters (continued).

Lights No.	100	150	200	250	260	300	400	500	600	700	Total.
Meters No.	37	41	34	1	1	3	0	1	1	1	18135

## Number and Size of Dry Meters in use up to March 25, 1878.

Lights No.	2	3	5	10	20	30	50	60	80	100	150	Total.
Meters No.	28	5	13	14	10	2	7	1	2	1	2	90

During the year the illuminating power of the gas has been tested daily on the Sugg-Letheby photometer, the gas being consumed in a "London" standard Argand burner at the rate of 5 cubic feet per hour, against two standard sperm candles, each consuming 120 grains of sperm per hour, corrections being made for barometric pressure and temperature, if required. The quantity of gas consumed each quarter is also given.

	Gas Consumed.	Max.	Min.	Average.
Quarter ending June	26,309,700	19-70	16-80	18-29 candles.
Do. September	29,134,600	18-00	16-00	17-13 "
Do. December	90,638,800	19-90	16-60	17-95 "
Do. March	73,494,800	19-60	17-30	18-29 "
Total for year	219,577,900	Yearly average		17-91 candles.

Table showing Proportions of Sulphur in other Forms than Sulphuretted Hydrogen in Grains per 100 Cubic Feet of Gas.

	Maximum.	Minimum.	Average.
Quarter ending June	21-44	10-90	17-31
Do. September	16-48	10-31	14-43
Do. December	13-36	4-99	9-83
Do. March	16-20	9-88	12-65
Yearly average		13-55	

Only on one occasion the quantity of sulphur found exceeded that allowed by Act of Parliament, being 1-44 grains in excess.

With regard to sulphuretted hydrogen, this impurity has, with few exceptions, been detected in the ordinary and continual test.

The gas has also been remarkably free from ammonia, only showing, on rare occasions, traces of this impurity.

(Signed) WILLIAM J. PETRIE, Chairman.

May 2, 1878.

## Dr.—Profit and Loss Account from March 31, 1877, to March 25, 1878.

To Gas-rental, general account	£40,340 0 5½
Public lamps, including lighting, extinguishing, cleaning, and repairs	4,970 16 4
Public lamps, Castleton Local Board	159 5 7
Do., Wuerdle and Wardle do.	91 3 0
Sundry accounts	31 19 9
	£45,593 5 1½
Tar and ammoniacal liquor	£3,227 13 8½
Coke	2,643 8 4
Fitting trade	144 2 5
Cottage rents	24 4 6
	6,039 8 11½
	£31,632 14 1

## Cr.—Profit and Loss Account.

By Carbonization—	
Stokers wages	£3,158 3 10½
Coal and cannel	£17,507 18 2
Horse and cart work	993 13 4½
Men's wages, unloading, stacking, &c.	532 16 0½
	19,034 7 7
	£22,192 11 5½
Purification—	
Wages	£364 8 10
Lime	276 9 2
Oxide of iron	184 0 9
	£824 18 9
Less spent oxide and lime sold	299 9 11½
	525 8 9½
Yard labour—	
Wages	£589 3 1½
Cartage	172 12 5
	761 15 6½
Wear and tear, retorts—	
Wages	£104 18 10½
Retorts, &c.	584 19 0
Castings	158 7 0
Cartage	28 13 8
	£1,176 18 6½
Less materials sold	3 15 5
	1,173 3 1½
Wear and tear, works and tools—	
Wages	£730 17 11
Ironwork	558 14 8
Joiners, slaters, and masons	231 17 11
Oil, paint, and cement	157 1 0
Hemp, waste, and lead	17 11 0
Water-rent	79 2 9
Cartage	32 1 0
Sundries	71 11 2
Drains and pipes	103 10 0
	£1,982 7 0
Less old iron, &c., sold	26 5 0½
	1,956 1 11½
Wear and tear, mains and services—	
Wages	£249 12 1
Pipes and castings	542 14 10½
Sundry materials	73 4 11
Lead	33 0 0
Cartage	53 18 0
Paving	97 0 11
	£1,049 10 9½
Less materials sold, &c.	394 1 4½
	655 9 5
Meter inspection, wages	565 8 6
Salaries and office expenses—	
Salaries	£908 7 8
Auditing	15 0 0
Printing, stationery, stamps, &c.	171 18 3
	1,098 5 11
Miscellaneous expenses—	
Travelling expenses	£34 14 9
Commission, per bank	55 0 0
Advertisements	34 2 11
Professional charges (Newbigging's)	70 3 6
Compensation	37 2 10
Sundries	9 17 4
	£241 1 4
Less meter-books sold	6 4 2
	234 17 2
Wear and tear, lamps—	
Wages	£956 16 1
Repairs and materials	125 6 3
	£1,085 2 4
Less materials sold	17 18 9
	1,067 3 7
Rent of land	£161 14 1
Rent, rates, and taxes	1,223 17 3
	1,385 11 4
Discounts on gas-rental	£2,295 9 2
Bad debts, estimated	60 0 0
	2,355 9 2
Interest on loan account	£7,045 15 3
1-75th part of mortgage debt to sinking-fund	1,993 3 8
	9,038 18 11
Balance, being profit	8,622 9 2½
	£31,632 14 1



Dr.—Balance-Sheet.  
Assets.

To Value of gas-works, as per last year's balance-sheet.	£161,539 17 2
Less amount allowed for depreciation, being 1-75th part of debt	1,993 3 8
	£159,546 13 6
Amount expended from April 1, 1877, to March 23, 1878—	
Mains.	£1,368 17 9
New services	394 8 0
New governors, governor-house, offices, &c.	759 0 11
Hydraulic stokers	535 8 5
Extension of No. 3 retort-bed	264 6 0
Paving Dane Street	283 16 5
New drains	233 9 10
No. 4 gasholder-tank	4 12 5
New lamps	102 4 0
	£4,046 3 9
Less balance of purchase and sale of horses and carts.	21 2 6
	4,025 1 3
Present value of works	£163,571 14 9
Amounts due	
Gas-rental	£12,854 19 84
Public lamps rental	4,970 16 4
Do. Castleton Local Board	51 11 5
Do. Wuerdle and Wardle Local Board.	42 5 7
Sundries ledger.	1,470 5 34
Fittings ledger	62 1 5
	19,451 19 9
Stocks, as per details in stock-book—	
Coal and cannel	£1,788 15 0
Main-pipes	898 19 5
Fitting trade	566 5 3
Wear and tear of mains, &c.	538 15 5
Oxide of iron	40 0 0
	3,852 15 1
Amount advanced to Contractor on account of new governor-house, offices, &c.	578 0 0
Balance in the Manchester and Liverpool District Banking Company	4,830 5 11
Balance, cash in hand	0 0 04
	£192,864 15 64

Cr.—Balance-Sheet.  
Liabilities.

By Amount of mortgage debt, as per last year's balance-sheet	£141,736 0 3
Amount borrowed this year	30,000 0 0
	£171,736 0 3
Amount borrowed from depreciation-fund	9,063 2 11
	£180,799 3 2
Less 1-75th part of debt paid over to the Finance Committee for sinking-fund	1,993 3 8
	£178,805 19 6
Debts owing on trade account	5,153 16 10
Bad debts on gas-rental	274 12 6
Deposits, being amount paid in advance for gas	7 17 6
Balance, as per profit and loss account.	8,622 9 24
	£192,864 15 64
Total amount of money borrowed	£214,413 2 11
Amount of depreciation-fund	£9,063 2 11
Mortgage debt paid off from March 31, 1853	35,607 3 5
	44,670 6 4
Mortgage debt owing March 23, 1878	£169,742 16 7

## Dr.—Capital Account.

1844 To Amount paid late Gas Company, and expenses incident to purchase.	£27,700 0 0
Extension of gas-works, 1845 to 1878.	176,778 18 2
Balance	9,934 4 9
	£214,413 2 11

## Cr.—Capital Account.

1844 By Amount borrowed from Hand in Hand Assurance Society	£27,700 0 0
1845 Amount borrowed from depreciation-fund	464 17 1
1846 Amount borrowed from various persons	1,750 0 0
1853 Amount borrowed from depreciation-fund	8,598 5 10
Amount borrowed from various persons, 1853 to 1878 (including £2000 borrowed from the Finance Committee in 1866)	175,900 0 0
	£214,413 2 11

## WALTON-ON-THE-NAZE GAS AND WATER COMPANY.

The Board of Trade have, under section 4 of the Gas and Water Works Facilities Act, 1870, made a Provisional Order in the case of the application of this Company, notwithstanding that the consent of one of the Local Authorities was not obtained. The application was for authority to maintain, continue, and extend existing gas-works, and to maintain and continue existing water-works in Walton-on-the-Naze, and to construct two wells, with pumping-station and reservoir, in the parish of Frinton, for the supply of potable water to Walton-on-the-Naze. The Local Authorities are the Walton-on-the-Naze Improvement Commissioners (acting under their local Act of 1841, and acting also as the Urban Sanitary Authority, under the Public Health Act of 1875) and the Local Board of Frinton. The former Authority having refused their consent to the granting of the Order, the Board of Trade appointed Major Marindin, R.E., one of their Inspecting Officers, to hold a public inquiry, and to report to them on the matter. The Local Government Board Inspector for the district was present on the occasion. The report of Major Marindin was as follows:—

There is absolute need for the early provision of a proper supply of potable water, the existing supply, although there is considerable difference in the analyses of it submitted, being admittedly quite unfit for drinking.

There is also great need for proper appliances for delivering the existing supply for public purposes, so that the drains may be properly flushed. At present they are neither flushed nor ventilated, and, no doubt, some of the bad smells attributed to the gas-works are really due to this want.

The Urban Authorities have been, since 1876, pressed by the Local Government Board to take steps to provide proper water for the town, but have done very little, and have matured no scheme.

The finances of the Urban Authorities are admitted to be in an embarrassed state, and the Commissioners own that they would be glad to be relieved by any substantial Company from the obligation to undertake works for the supply of water.

Under these circumstances, therefore, and after duly considering the evidence and arguments on either side, I am of opinion that the Order should be granted; for, although it cannot be denied that the present site of the gas-works is objectionable to the surrounding householders, yet the supply of good water is of paramount importance to the whole population, whose interests must first be considered, and I believe that the best,

if not the only, means by which such supply can be obtained, within any reasonable time, is by giving the necessary powers to this Company.

The past action of the Commissioners does not encourage the hope that they would be able to cope with the difficulty, while the doubts raised by them as to the resources of the Company have, I think, insufficient grounds. It is true that the works are in a great measure the property of one individual, but he is the largest owner of property in Walton, and is the proprietor of the land proposed to be assigned, and these very facts afford fair ground for thinking that this Company is more likely to find the necessary funds than any other body connected with the place.

It would, no doubt, be better if the gas-works could be moved, but this cannot be insisted upon. In the interests, however, of the surrounding householders, powers should not be given for storing residual products, or for any increase in the appliances for the manufacture.

The Board of Trade accordingly dispensed with the consent of the Walton-on-the-Naze Improvement Commissioners, and made a Provisional Order embodying this and other recommendations of Major Marindin.

## NORTH OF ENGLAND GAS MANAGERS ASSOCIATION.

(Continued from p. 766.)

Mr. WATSON (of the firm of T. S. Johnson and Co.) read the following paper on

## IMPROVEMENTS IN THE MANUFACTURE OF PORTLAND CEMENT.

Scarcely has the comparatively short space of 50 years elapsed since the first bushel of Portland cement was produced, and well-nigh half that period had passed away ere it appeared before the public as an article likely to compete successfully with other hydraulic cements. The makers of Roman cement used every means in their power to impede the growing reputation of Portland, but their exertions were not crowned with success.

The late Sir Robert Peel, labouring under an impression that "Roman" was the only hydraulic cement extant, and fearing that the raw material from which it is produced was being exhausted, was led to speak at considerable length in the House of Commons, regarding the advisability of imposing a tax on the material, so as to reserve a sufficient supply for the purposes of Government works.

One of the few Portland cement makers, hearing of this, had an interview with Sir Robert on the subject, produced samples of Portland, and evidence sufficient to prove that there was little cause to be alarmed as to the supply of a hydraulic cement, and in consequence the proposed tax was abandoned.

It is not my intention to weary you with a category of the vicissitudes in the history of Portland cement; the multitude of purposes for which it is used is the best evidence that can be presented of the increasing popularity and established reputation it enjoys.

As the great extent of its application has increased, so has it been the aim of the careful cement maker to obtain increasingly satisfactory results from his manufacture; and considering that the specifications issued by several Governments, and other important Works throughout the world, at times contain conditions so stringent, it is imperative that the manufacturer employ his talents to the very best of his ability in perfecting the manipulation, so as to produce a cement capable of giving entire satisfaction. From time to time numerous alterations have been introduced in the appliances employed in the production of Portland cement, but up to a very recent date, so unimportant have these changes been, that their value would be exaggerated if they were called improvements. A striking contrast to this normal state of affairs has, however, lately presented itself; alterations are being made highly beneficial to the manufacturer, and consequently advantageous to the consumer and the public. Recently more than one specification has been sealed at the Patent Office, under the heading of "Improvements in the Manufacture of Portland Cement," and not the least important of these is the chamber system, invented by Mr. Isaac Charles Johnson.

When alterations are made, and new appliances are introduced in the process of manufacture, the adoption of which results in the economy of fuel and labour, as well as greatly diminished space requisite for manipulation, the advantage gained by the manufacture must be considerable; but, if these economical changes or improvements can at the same time ensure higher perfection in the quality of the finished manufacture, the value of those appliances cannot be over-estimated. The chamber system possesses all these qualifications to a singular degree, as the following attempt at explanation will show.

It is agreed by all who have had an opportunity of giving any attention to the art and science of Portland cement making, that one of the most important points in the manufacture is the proper mixing of the crude materials. This process of amalgamation is usually accomplished by the agency of water in the wash-mill. After the particles of the materials have been thoroughly incorporated, the aggregate, or "washed stuff," is pumped into large reservoirs, there to undergo the process of settlement, in order that the surplus amount of water, requisite for the proper amalgamation in the wash-mill, be drawn off, by that means bringing the washed material into a state preparatory to the drying process. This process of settlement, which requires at least three to four weeks, is attended with many serious disadvantages, especially when this settling occupies some months, which is often the case where the area of land available is limited, rendering deep reservoirs a necessity.

However perfect the appliances employed for the complete and thorough incorporation of the materials in the wash-mill are, the process being purely mechanical, the intimate connection that one particle bears with another is only temporary, because the two principal components—carbonate of lime and silicate of alumina—differ considerably in their specific gravities; consequently, the careful manufacturer has frequently to resort to means and appliances both tedious and expensive, with the view of restoring the mixture to its original proportions, after settlement, before subjecting the material to the next process of drying. Johnson's chamber system provides that these objections are entirely obviated. The washed material is pumped direct from the mills into a horizontal flue or chamber, through which the waste heat given off from the kilns passes; the effect of this heat renders the fluid material a solidified mass in a few hours, thereby preventing any possibility of unequal subsidence, as is the case in the open reservoirs.

Unequal calcination during the process of burning has always been a cause of annoyance and expense to the cement manufacturer. An unusual disturbance in the atmosphere causing an excess of draught, a slight deviation on the part of the burner in the quantity of fuel employed for the proper calcination of the cement, the ever varying proportion of combustible power contained in the fuel, are all difficulties liable to present themselves when the now old-fashioned open-topped kiln is in use. The chamber kiln is fitted with a complete system of dampers, thereby placing under control the augmentation or reduction of draught, as circumstances may require, so as to produce well-burned cement, and enabling the burner to calculate the minimum quantity of fuel necessary, with an accuracy hitherto unknown in cement making.

When a process of manufacture occupies a few days, which has formerly required as many months, it is obvious the saving in capital must be very considerable; therefore, financially, a boon to the manufacturer; but the consumer reaps special benefits from a process of rapid manufacture, inasmuch as it gives the cement maker a better opportunity of controlling



the many variations that continually occur during the process of manufacture, thereby enabling him to guarantee, with more confidence and greater certainty, the suitability of his cement to the purpose for which the consumer requires it.

In addition to these many advantages gained by the adoption of the chamber system, there are several other recommendations which, although not directly affecting the consumer, are of such importance to the cement maker, that, in an indirect way, the purchaser must reap a certain amount of benefit.

The immense economy attained by dispensing with the drying stones and their necessary belongings, the wear and tear of which, and continual repairs, form a very considerable item in the charges account of a cement manufactory, is one of the many benefits derived by adopting the now popular chamber kilns.

Although this system is comparatively in its infancy, eight different cement makers, manufacturing a total per annum of not less than 90,000 tons entirely by chamber kilns, is a significant proof that the arguments just put forth are not alone based on theory, but substantiated by a wide practical experience.

Another improvement of scarcely less importance than Johnson's chamber system, has also recently established for itself a reputation, clearly proving its value in cement making by its extensive adoption.

Goreham's patent process of washing, as far as the consumer of Portland cement is concerned, carries with it the same recommendation as the chamber system, in that its adoption by the manufacturer undoubtedly tends to improve the quality of his cement. As mentioned before, it is an old-established fact that one of the most essential points in the manufacture of Portland cement is the proper mixing of the crude materials. By proper mixing is understood, the right apportionment of these materials in the mill; the reduction of the particles of each compound to the utmost degree of fineness that is attainable, and their intimate and thorough amalgamation, so as to prevent, as far as practicable, their being again separated.

In the system of washing hitherto adopted, it has been considered necessary, in order to ensure the thorough amalgamation, that the materials must be diluted with not less than three to four times their weight of water. As this large amount of water requires to be drawn off again, through the agency of the subsiding ponds, or by evaporation when the patent chamber kiln is employed, it is obvious that any system which will ensure satisfactory results; and, at the same time, will allow the manipulator to dispense with a large proportion of this water, is very valuable. Goreham's system possesses this advantage. Mr. Goreham subjects the materials to a process of wet grinding, which, to a certain extent, takes the place of washing. The chalk and clay are thrown together in the right proportions into a mill fitted exactly similar to the present wash-mills; but instead of being reduced to a liquid with the usual large proportion of water, they are brought, by the addition of only one-third their weight of water, to a consistency just thin enough to flow out of the mill. But as this mixture contains a large proportion of coarse particles of the aggregates, which require further reduction, the mixture is passed through horizontal millstones. By this process the particles are speedily reduced to an impalpable paste, of a fineness unattainable by the ordinary process of washing, and the mixture is of sufficient solidity as to render the intermediate process of settlement unnecessary, the slip or paste being pumped direct to the drying stones or chambers, thus avoiding the possibility of any separation of the component parts.

Although Johnson's chamber system possesses the like advantage of dispensing altogether with the settling-ponds, it has been proved by experience that occasionally a small extra per centage of fuel is necessary in the chamber kiln to evaporate the large proportion of water contained in the "washed stuff" when prepared by the ordinary method in the wash-mill. Experience has likewise demonstrated that when the stuff is supplied to the patent chambers from Goreham's wet grinding mill, a considerably less amount of fuel is required for the calcining and drying of the material than by any other process that has yet been employed in cement making.

It is an extraordinary and happy occurrence that two distinct processes of such vast importance to the cement manufacturer should be brought forth and presented to the world almost simultaneously, the combined working of which (although both are in a state of comparative infancy) are even now producing results far exceeding the expectations of the most sanguine.

In order that you may more accurately estimate the advantages gained, so far as the quality of the cement is concerned, it is, perhaps, advisable to endeavour to explain in a more lucid manner why Portland cement, which has been subjected to the processes just mentioned, must of necessity take precedence in the testing-room over cement manufactured by the old-fashioned system.

Competent judges are all agreed that slow-setting, heavy, well-burned, finely-ground cement is undoubtedly the best. In order to arrive at the qualifications of "slow-setting" and "heavy" the manufacturer must regulate the mixture in the wash-mill, so as to use a maximum proportion of chalk. If the mechanical mixing in this first stage of manufacture has been so complete as to accomplish a perfect amalgamation, the result will be satisfactory; but if the mixing has in the smallest degree been incomplete, the attempt to produce slow-setting and heavy cement will prove to be a disastrous failure, an article containing an excess of free lime will be produced, which will necessarily blow when used, causing a general expansion of the work, the fatal consequences of which need not be referred to. Hence the advantage of adopting a process by which a complete amalgamation is secured.

Again, cement that is not well burned possesses the same serious tendency to expand. It is true that in most manufactories where the open-topped kilns are in use, care is taken that the under-burned cement is separated from the well-calcined clinker; but prevention is better than cure.

Lastly, cement which is over-burned assumes a flinty metallic-like nature as clinker in the kiln, most difficult to pulverize, and useless for producing cement possessing the element of being finely ground. It must, therefore, be obvious that a system which can assist to perfect the calcination will be an important stepping-stone towards attaining those last-mentioned qualifications of well-burned and finely-ground cement.

With these explanations, I have more confidence in having trespassed on the valuable time of the Members of this important Association, to present to their notice improvements in the manufacture of an article now occupying so prominent a position in gas engineering; and when the fact is established that manufacturers are now introducing plans and adopting appliances which will increase to a very considerable extent the hardness, hydraulicity, and durability of Portland cement, I am sanguine that the patronage which gas engineers have already conferred on cement will increase to such an extent as will not bear comparison with the past, especially when I inform you that in adopting the patents I have just referred to it is necessary that the manufacturer should purchase all the fuel required in the shape of coke, which is not the case in the old-fashioned method of cement making; and I may mention that experiments and

experience have taught me that good gas coke is the best description of fuel that a cement manufacturer can adopt.

Mr. R. SMITH (Darlington) read the next paper, which was

#### ON CONDENSATION.

In the early history of gas lighting we read but little about condensation, although it was then, as it is now, an essentiality of gas manufacture. From the time gas was first used for artificial lighting until now, many forms of condensing apparatus have been devised, and many alterations and improvements have been made; but I do not think even yet that this particular part of purification has received the amount of attention that it deserves. It has often been asserted that "good condensation is half purification." Well, it may not be quite half purification, although it plays a very prominent part in the process of gas manufacture, and is worthy of receiving that amount of attention which it does not receive. Certainly, in the process of condensation, the gas is not cleansed of the sulphuretted hydrogen or the sulphur compounds, condensation being a mechanical operation, but it is separated from the tarry and watery vapours which it contains, and reduced to that temperature which makes the other processes of purification more easy. If by imperfect condensation and cleansing the gas from tarry and watery vapours, as by imperfect purification from sulphuretted hydrogen, the gas was sent impure to the consumers, a much greater interest would be taken in it; still if, by imperfect condensation, gas containing sulphuretted hydrogen is not sent to the consumers, but tends to decrease the prosperity of a gas concern, is it not as much our duty to favour the employer as to favour the consumer, and does it not bring with it a greater amount of satisfaction to ourselves? Condensation is the first process of purification, and if it be defective, the other processes will be defective, because they are directly and indirectly connected with, and influenced by it. The question now arises: What is good condensation, and how is it to be arrived at, and what advantages arise, from having a sufficient and proper arrangement of condensing apparatus? I do not purpose entering very fully into this subject, but I trust the few remarks I do make will not be devoid of interest.

The tarry and watery vapours present in the crude gas will condense somewhere, and where can this be better done than in the apparatus constructed for that purpose; but if it be insufficient or incapable of doing so, the scrubbers or washers, purifiers, and street-mains will become condensers, which certainly is anything but pleasant or profitable. The condensers are intended to cool the gas to a certain temperature, and cleanse it from the tarry and watery vapours which it contains in its crude state, and, to perform this work thoroughly and well, they must be of sufficient capacity and construction so as to reduce the gas to its lowest temperature, and at the same time remove these impurities before the gas has issued from them. If condensers cannot perform this work, it is a waste of money in having them erected at all. It is estimated that the temperature of coal gas in the retort does not exceed 135°, and this must be gradually and regularly reduced. The gas in the first and second columns of the condensers is often reduced about 25°, whereas the remaining columns, six in number, will not reduce it 20°. There is no regularity about this, and I would suggest that the columns be regulated to make—or as nearly as possible to make—the reduction at this ratio, viz. :—

Gas enters at, say—	First Column.	Second Column.	Third Column.	Fourth Column.	Fifth Column.	Sixth Column.	Seventh Column.	Eighth Column.
100°	96°	90°	83°	72°	62°	55°	51°	49°

The lowest temperature to which the gas is exposed will be rather under 49°, but it is better to be under than over condensed, because in the latter case there is danger of depositing the hydrocarbons, and, consequently, damaging the illuminating power; also danger of depositing naphthalene in the main and service pipes; and how often are the inlets and outlets of our gasholders choked up by this naphthalene, or "salts," as it is generally called.

It is a very difficult matter to have condensation perfect, because of the great irregularity in the quantity of gas manufactured, and the variation of the atmospheric temperature, but I believe it might be a great deal nearer perfection than it presently is, and the nearer it is to perfection, the better will be the result financially.

A great many different arrangements are put forward, by their own advocates, as being competent to perform this task of condensation efficiently.

We have, for instance, the battery condenser, the underground condenser, the horizontal condenser, the annular condenser, and the water channel condenser. The last two mentioned are looked upon with more favour than the others. In the water channel condenser, I believe that the gas is cooled too quickly—that is, if the water can always be kept cold. Hughes says: "Where the gas has an excess of temperature of 10° over the atmosphere, a unit of surface which would radiate eight parts of heat in the open air, would, in water, radiate no less than 88 parts," or "where the gas has an excess of 30° over the atmosphere, a unit of surface which would radiate 29 parts of heat in the open air, would, when plunged in water, radiate no less than 5353 parts of heat." This certainly shows the superiority of water as a cooling medium, but I believe that gas is not wanted to be cooled in such a hurried manner, and on this account I do not think that the water channel arrangement of condensation will ever attain a great standing as a condensing medium, and more than this, no matter how the water may be regulated, and put in or drawn off the cistern that contains the piping, no matter how many division-plates are fixed to regulate the flow of water against the flow of gas, the temperature will not be reduced proportionately, and it is impossible, under such circumstances, that good condensation can be effected.

The annular condenser has attained a greater standard than the water channel condenser—indeed, than all other condensing arrangements—although I believe it is deficient, because the current of air is equal in the inlet column to that of the outlet column; the result being that the gas is lowered too quickly in the first column, and reduced to its lowest temperature not proportionately. I believe it would add to the efficiency of this condensing arrangement if the first and second columns had no inner cylinder, or if the current of air was regulated at the top or bottom of each column, and this could easily be arrived at by placing small doors or covers of such construction that they would act as dampers, and so regulate the draught as necessitated by the temperature of the gas and atmosphere. A thermometer would be required for each, or every alternate column; but the process of cooling and cleansing the gas from the tarry and watery vapours would go on smoothly, regularly, and efficiently. This condensing apparatus is subject, like other condensing arrangements, to become choked with tar and sulphates, unless there be some preventive, and it is rather awkward getting them cleaned out, especially in the winter months; and when there is no bye-pass, and while they are being repaired, the gas passes onward to the scrubbers and the purifiers without being condensed at all. Now, it is a very easy matter to have a steam-pipe



connected to the end of every fourth or fifth column; open the tap occasionally, the steam is carried along with the gas; the temperature of the interior of each column is raised, say, 30° over the ordinary temperature, and the tar and sulphates are deposited in the bottom box. We have this arrangement in Darlington, and are never put to inconvenience by foul condensers, and have always the same area of cooling surface. I am aware that a number of Managers have adopted this system of cleansing by steam; but a good thing is none the worse for being told over again, and, perhaps, there may be a few who have not considered the advantages of it, and I believe that, when a condensing column has an internal coating of one inch, its action is greatly impaired, and, if it be allowed to grow much over that thickness, it is a condenser in name only, not in action, because the gas is robbed of the cooling influence of the atmosphere.

A great difference of opinion seems to prevail as to what quantity of surface is necessary for the proper condensation of gas; but it is generally considered that 150 square feet of surface is required for every 1000 cubic feet of gas manufactured per hour. I do not consider this a good criterion, or a rule to be depended upon, because a great deal depends upon what kind of apparatus is employed, how it is worked, as well as the atmospheric temperature, and much also depends on the temperature of the retort, the position of the hydraulic main, and the length of piping through which the gas passes before entering into the condenser. Another consideration is the coal that we use. Clegg says: "Some kinds of coal require greater condensing power than others. The coals from the Midland Counties, for instance, yield twice the quantity of aqueous vapour that Newcastle coal produces during distillation." So we may be satisfied that it matters little how many feet of surface we have to bring the gas in contact with; if it be not properly applied, good condensation cannot be effected. If the cooling influence in the first column is as great as in the last column, how can the gas be properly cooled and condensed? If the gas issues from the last column of the condenser at a higher temperature than that to which it will be exposed, or if it issues from the last column at a temperature of, say, 65°, and enters into the first scrubber or washer, which shows 60°, how can the gas be properly cooled and condensed? Consequently, the scrubbers are unable to perform their part of the purification, because the gas does not enter into them properly cooled; and if not properly cooled, not properly condensed from the fatty and watery vapours, and the purification of ammonia is impaired. If the gas enters the purifiers at an excess of temperature, the lime also loses its affinity for removing the carbonic acid, and we know that carbonic acid gas is not only unflammable, but it instantly extinguishes flame even when diluted with three times its volume of air; so it is essentially necessary that this impurity should be at least partly removed from the gas, and we know, from various authorities, that its presence, only to the extent of one per cent., will diminish the illuminating power of coal gas fully 5 cent.; and, more than this, if the purifying lime is made hot by the gas, it very soon becomes hardened up, and requires to be taken out before being fully saturated with sulphuretted hydrogen; otherwise, keep on working for a day or two against a crushing back pressure. But even taking it for granted that 150 feet of surface is sufficient, when properly applied, we must have the condensing apparatus divided by valves, so that in the summer months, when the make of gas is at its minimum, the gas will not pass through all the columns, but have only, or as near as possible, the same area of 150 feet; although I believe that, in any case, it is advantageous to have the condensing apparatus divided, so that we can have more or less cooling surface as necessitated by the variation of circumstances under which we labour.

The principal—in fact, the only argument, advanced in favour of underground condensation is that, by keeping the gas in contact with the tar, the illuminating power would be increased; but if this does increase the illuminating power, it could be equally well performed by placing pipes along the interior of the retort-house wall, where the temperature is nearly always equal, and where tar will always be found in the pipes, and at a temperature that would not condense the hydrocarbons, which, however, would be the case, and especially at the end pipes of the underground condenser. It has been asserted that while the temperature of gas is being reduced from 120° to 110°, it is enriched with the volatile oils contained in the tar, but if it be kept in contact with the tar after this, and while being further reduced in temperature, those oils drop off or are condensed.

From this we can infer that the retort-house piping is a capital system of condensation, and much superior to the underground condenser, so far as keeping the gas in contact with the tar, as a means of increasing the illuminating power, is concerned, because where the one is defective the other is efficient—that is to say, tar at every temperature will not give off the volatile oils, and while it would give them off in the retort-house piping, it would not in the underground condenser.

Of one thing, however, we are satisfied, and that is, that the tar should not be carried any further than the condenser, because, if it is, in addition to decreasing the illuminating power, it will gradually close the gas passage in the scrubbers or washers, and tar having an affinity for naphthalene, a total stoppage will naturally follow, and the apparatus require to be put out of use, and, perhaps, when it can be least spared; certainly, if a current of water or ammoniacal liquor is kept constantly flowing through these vessels, the tar and naphthalene may not be deposited there, but especially in small works, water or ammoniacal liquor is seldom passed through the scrubbers. Mr. R. H. Patterson, ex-gas referee, speaking on this subject, says "One disadvantage of tarry matter being allowed to pass forward from the condenser is that the tar chokes up the interstices in the coke or brick scrubber, so that the gas, instead of ascending equally through all parts of those scrubbers, forces a passage upwards by comparatively few routes, and thereby does not come in a proper manner in contact with the purifying water." Also, "The water or liquid in the scrubbers is raised above the ordinary temperature, whereby its power of absorbing ammonia is lessened, while at the same time the liquor from the scrubber, gives off into the air, a larger portion of the ammonia which it contains than it would do at a lower temperature."

From this we can infer that if the ammoniacal liquor is made warm by the gas not being properly or sufficiently cooled in the condenser, its power of absorbing ammonia is lessened, and the gas goes to the consumers containing that impurity. It may or it may not be detected, but one result is certain, and that is, the brasswork of some hundreds, perhaps thousands of meters, and the fittings of dwelling-houses, are being eaten up. While this is taking place outside, the apparatus inside is foul and there is little or no gas passage. The engine and exhaustor are battling with a heavy back pressure, which means a greater consumption of fuel; the rich illuminants are being partly deposited, a less quantity of gas is obtained from a given quantity of coal, and, as a matter of result, bad returns. So if good condensation is not half purification, it certainly plays a very prominent part in the half-yearly balance-sheet. If inefficient condensation bring with it such serious results, is this subject which I have taken up not worthy of receiving more attention in the future than it has received in the past?

Some discussion followed at the close of Mr. Smith's paper, in the course of which Mr. Nelson (Glasgow) described a process of gas purification proposed by Mr. Steel, the inventor of the Steel and M'Innes Railway Brake, which was intended to serve for all the three purposes of condensing, scrubbing, and purifying coal gas.

Hearty votes of thanks were passed to the several gentlemen who had favoured the meeting with addresses, and also to Mr. Donaldson, of Edinburgh, for his exhibition of the Foulis Governor and Lamplighter, both of which were at work in the room.

At the close of the meeting, the CHAIRMAN announced that the following officers were elected for the ensuing year:—

President—Mr. J. Hepworth, Carlisle.  
Vice-President—Mr. William Ford, Stockton-on-Tees.  
Secretary and Treasurer—Mr. William Hardie, Newcastle.

Auditor—Mr. John Booth, Middlesbrough.  
Committee—Messrs. J. H. Cox, Sunderland; Charles Sellers, York; Thomas Trehwhitt, West Hartlepool; and William Smith, Darlington.

The Members of the Association, with their friends, dined in the afternoon at the Crown Hotel. The President (Mr. W. J. Warner) occupied the chair, and the vice-chair was ably filled by Mr. J. Hepworth (Carlisle). The usual loyal toasts having been duly honoured,

The CHAIRMAN proposed "The Army, Navy, and Reserve Forces," coupling with the toast the names of the Mayor of Middlesbrough (Colonel Sadler), and Colonel Cowen of Blaydon.

Both gentlemen having responded, Colonel COWEN proposed "Success to the North of England Gas Managers Association," and, in doing so, said it had given him great pleasure to be present at the meeting that day, and participate in the knowledge that had been disseminated amongst them. The Association was in a most satisfactory state, and he felt sure that it would be a worthy co-operator with the parent society. He certainly looked to it in this light—that it would be one of the feeders of the great river, the great output of the whole, and he trusted that whether there might be another society in the west, east, or south of England, they would all be tributaries to the one great source. They were perfectly justified in having a minor institute in the North of England, and he was pleased they had so substantial a one formed. He trusted that the influence already disseminated amongst the Gas Managers in this district would extend still further, and include the whole of the northern counties in the infant Association. They had the opportunity of hearing papers read, and no doubt they would be of substantial interest to those connected with the manufacture of gas. Coupled with the toast, he gave the health of Mr. Warner, and expressed the hope that the Association might long have the pleasure of that gentleman's good counsel, his friendship, and his knowledge at their meetings.

The PRESIDENT responded.  
The VICE-CHAIRMAN gave "Kindred Associations." He hoped the day would come when the whole of the districts in the North of England would be covered by Associations of this kind. They were conducive not only to pleasurable intercourse, but also to profitable intercourse with respect to all matters connected with their own branch of science. With the toast he coupled the name of Mr. Nelson.

Mr. NELSON (Glasgow) having responded,  
The healths of the Vice-Chairman, and of the Secretary (Mr. W. Hardie) were drunk. Other toasts were also proposed, and the proceedings then terminated.

COLNE (LANCS) GAS COMPANY.—At the last meeting of Shareholders, on the 7th inst., a resolution was passed expressing unqualified satisfaction with the way in which the affairs of the Company have been conducted by their chief officers—Mr. Thomas Varley, the Manager, and Mr. C. Tatham, the Secretary. A sum of £50 was also voted to each of these gentlemen as a testimonial of the appreciation in which their services are held by the Directors and Shareholders.

ROTHERHAM AND ITS ENGINEERING TROUBLES.—A "noiseless" gas-engine recently made considerable noise in the Sheffield County Court. Though probably silent itself, it was the cause of much speaking on several days by the gentlemen of the long robe. The neighbouring town of Rotherham has not been troubled with an affliction of this sort; but it has also had its own ills to bear, and not the least of these has been a gas-tank. At various times since the incorporation of the borough—for Rotherham is as yet a juvenile among the corporate bodies of the country—the Gas Committee of the Town Council have discussed the desirability of providing themselves with a Consulting Engineer. Some time ago the Corporation decided to extend the gas-works, and amongst other undertakings they have constructed a new purifying-house and a large gas-tank. During the heavy rains, about the beginning of last year, a wall of the purifying-house fell into the river, and the great gale at the close of the year demolished the roof of the same unlucky building. As if these misfortunes were not sufficient, it was subsequently discovered that the new tank would not hold water. The "accidents" induced the Gas Committee to renew their discussion about the Engineer. As the wind blew and the rain beat about that house—that purifying-house—it struck them more forcibly than before that they could do with professional advice; and when they found their new tank failing in its mission, which was distinctly to hold water, that impression was deepened upon all their minds. Mr. John Depledge, of Sheffield, was accordingly appointed the Consulting Engineer, at a salary of £100, which was certainly not an extravagant remuneration. His first bit of work was to prepare a plan for the repair of the tank. He did so, and obtained a contract for the work to be done according to a schedule of prices. He estimated the cost at £1300. This was considered a somewhat elaborate plan. It included pile-driving and other expensive operations. The Committee met last February to consider the plan. The result of their deliberations was a recommendation that the Council should adopt it. That body met in March, and honoured the scheme with a prolonged discussion, during which it was stated that Mr. Goodwin, the Gas Manager, had also a plan, and that Mr. Goodwin was prepared to give guarantees that his ideas could be carried out for £400. The Rotherham Corporation are only human, and when the Members were gravely told that what they wanted could be done for £400 instead of £1300, they resolved, by a majority of one, to refer the matter back to the Gas Committee for further consideration. That Committee met in March, and, by the Chairman's casting vote, they adopted the £400 plan. Their recommendation was considered by the Council at their April meeting, when, by another majority of one, making the third occasion when that all-powerful "one" had prevailed, they threw over the £400 plan, and fell back on the £1300! Here, perhaps, the reader supposes the matter rests? Not a bit of it. The Corporation, having evidently qualms of conscience on the score, subsequently came to the unanimous decision again to refer the matter back to the Committee for further consideration! Once more the Members of the Committee met. This time it was a special meeting, at which Mr. Depledge and Mr. Goodwin agreed to jointly prepare a plan for carrying out the work. Thus stands the "situation." At this rate of progress, it may be fairly anticipated that by the time the tank and purifying-house are put to rights, Rotherham will be in a fair way to know how to do without both of them.—Engineer.



## WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

The Sixth Annual Meeting of this Association was held on Thursday, April 25, in the large room of the Public Museum, Paisley. There was a large attendance of members. Mr. JAMES M'GILCHRIST (Dumbarton) President of the Association, occupied the chair.

## ADOPTION OF MINUTES, ETC.

The SECRETARY (Mr. R. S. Carlow, Port Glasgow) read the minutes of the various meetings which had been held by the Committee of the Association since the previous half-yearly meeting at Helensburgh.

The PRESIDENT, in moving the adoption of these minutes, said: I beg to call special attention to the low state of the funds, which, in a great measure, results from the non-payment of subscriptions by gentlemen whose names are on the roll as Members of the Association. In the course of to-day's proceedings, a motion dealing with this unsatisfactory state of affairs will be proposed for the acceptance of the meeting. This is a state of matters that we must get rectified. It is useless to have Members on the roll if they will not pay for their connection with the Association. I have also to state that, at a Committee meeting held this morning, it was unanimously agreed to ask you to confer the distinction of honorary membership upon Mr. Hislop, of Paisley, who has done everything in his power to make this meeting a success, and I need scarcely add that, so far, he has been very successful.

The minutes were adopted, and the proposal of the Chairman was cordially adopted.

Mr. HISLOP: I have to thank you for the honour you have conferred upon me in electing me to the position of an Honorary Member of your Association. I appreciate and value this kindness very much, I can assure you; and if I have done anything in the way of contributing to the success of this meeting, I shall be happy; and if anything I can do will contribute to the further success of the meeting, I will willingly place my services at your disposal.

## ELECTION OF OFFICE-BEARERS.

The PRESIDENT: The Committee have to-day drawn up a list of office-bearers for the ensuing year, which I beg to submit to the meeting. Of course, any Member has the right to propose any gentleman he thinks proper. The proposed office-bearers are as follows:—

President—Mr. Samuel Stewart, Greenock.

Vice-President—Mr. William Young, Clippens.

Secretary—Mr. R. S. Carlow, Port Glasgow.

Treasurer—Mr. W. Smith.

Committee—Messrs. D. Jeffrey, W. Fairweather, Levi Monk, R. Mitchell, James M'Gilchrist, John Fleming, S. Dalziel, and James Renfrew. These gentlemen were unanimously appointed.

The PRESIDENT said: Mr. L. Hislop, Uddingston, retires from the office of Auditor, held by him for two years. The other Auditor is Mr. John Walker, Ayr, who continues in office for another year.

On the motion of Mr. RENFREW, Mr. Samuel Black, Alexandria, was appointed in room of Mr. Hislop.

## ADMISSION OF NEW MEMBERS.

The SECRETARY submitted the following list of

## Extraordinary Members.

Andrew Spencer . . Coal Merchant, Glasgow.

John Wilkie . . . Lime Merchant, Greenock.

Joseph Gilmour . . . Bonnyton Fire-clay Works, Kilmarnock.

R. M. Sutherland . . . Manager, Chemical Works, Falkirk.

Wm. Donald, jun. . . . Abbey Works, Paisley.

## Ordinary Members.

John Davidson . . . Dawsholm Gas-Works, Glasgow.

James Robb . . . Gas Manager, Ayr.

Charles Reilly . . . Strabane.

John F. Macfarlane . . . Stornoway.

On the motion of the PRESIDENT, seconded by Mr. RENFREW, these gentlemen were unanimously elected.

## ARREARS OF SUBSCRIPTIONS.

Mr. MITCHELL (Coatbridge): The matter of arrears is a subject which has been a cause for regret in Associations other than the West of Scotland, and it is a subject which the Committee have deemed it their duty to set a strong face against. I take upon myself the liberty of proposing that a Committee be appointed, with full powers, to draw up a list of arrears, and that the Committee shall have full powers to strike off the roll of membership those parties who are two years in arrears with their subscriptions.

Mr. FULLERTON (Motherwell) seconded the motion.

The PRESIDENT: By the rules this motion can only come into operation after the next annual meeting.

Mr. NIVEN (Dunoon): It is a great pity that any Members should be in arrear with their subscriptions; but perhaps the subscriptions may be too high. Considering the advantages which are derived from connection with an Association like this, I think all Members ought promptly and willingly to pay their subscriptions. It should, however, be remembered that most of the Members are "wee" Managers, with perhaps very limited incomes. In such cases I think the amount of subscriptions might be reduced. I think it would be unwise to eliminate a number of the defaulters, because it would make the Association more select, and in that way it would subvert, to a certain extent, the proposed object of the Association.

The PRESIDENT: We are indebted to Mr. Niven for the suggestion, and if it were the fact that the "wee" Managers are in arrear, there might be some force in what Mr. Niven has said; but the fact is that it is mostly those in good positions who are in arrear. With regard to the amount of subscription, this Association charges less than any that has yet been established—that is, considering the amount of work that it accomplishes. The annual report on the gas supply of Scotland is in itself a great expense, which other and kindred Associations do not incur, and comparing ourselves with the North British, the parent Association, we have a benevolent-fund to support, which they have not. Instead of the subscriptions being reduced, they ought to be increased, in order to meet the increasing demands which are being made upon us year after year, to have more efficient reports. But the Committee will consider Mr. Niven's valuable suggestion, and bring it up with the report which they will submit to the next annual meeting.

Mr. MITCHELL: I should like that special powers should be given to the Committee in regard to these arrears. I do not think that it is right the Secretary, who has other duties of a heavy kind, should be troubled in the future as he has been in the past, in writing letters to people who never reply.

Mr. FAIRWEATHER: I think there should be a rule to this effect, that, in cases where payment is not made within a limited time, the party should cease to be a Member after due notice being given.

The PRESIDENT: The Committee propose to bring some such recommendation before the next meeting.

## PRESIDENT'S VALEDICTORY ADDRESS.

The PRESIDENT then delivered the following Valedictory Address:—

Gentlemen,—I have great pleasure in meeting you all, after the labour of another winter, for mutual improvement on subjects connected with

gas lighting, at this the sixth annual meeting of this Association, and the first Gas Managers meeting ever held in this town, which is famous for many arts, including gas engineering. It also affords me much pleasure to state that during the year now numbered with the past your Committee are not aware of a single instance wherein the Association's efficiency was impaired by death. During the same period there has been no demand for aid from the benevolent-fund. Gentlemen, these are pleasant conditions, which few Associations with a like membership enjoy, and the facts mentioned say much for the general health and prosperity of the members.

The Association may be compared to the science of gas lighting, inasmuch as it is always progressing. To-day, we have a number of extraordinary and ordinary members admitted, giving us a grand total of over 200 members. I agree with your Committee, that the connection members have with this Association should be severed, and pass into history, whenever they allow themselves to run more than two years in arrears. If an Association is worth being connected with, it should be regularly supported.

## Prize Paper.

The Sub-Committee appointed to award Messrs. A. and J. Stewart's £10 prize for the best paper on "The Most Economical Mode of Manufacturing Gas from Coal or Shale to Produce an Illuminating Power of from 25 to 30 Candles" consider it right to allow the summer rather than the winter time for the preparation of papers. Managers who have forwarded papers can amend them, should they think fit. The date when all intending competitors must remit their papers to the Secretary will be duly advertised in the JOURNAL OF GAS LIGHTING. I trust the papers will be numerous, and worthy the liberality of the donors.

## Annual Report on the Gas Supply of Scotland.

Your last report on the gas supply of Scotland is, I believe, the most complete published. It is gratifying and encouraging to know that many, if not all, the Gas Managers who opposed the report on its introduction, a few years ago, are now cognizant of its great utility, and readily subscribe the important information it contains. "Every art is improved by emulation." Ours, being no exception to the rule, is greatly improved by the emulative spirit the report engenders among Managers. I will now venture to occupy your time and attention with remarks suggested by a few columns of the report.

## Carbonization.

To secure efficiency and economy in the carbonizing department, there should be at least from 15 to 20 per cent. more retort power than is required to produce the maximum daily make. One of the advantages of this is that retorts can be worked until it is prudent to let them out, whereas, with limited carbonizing surface, used, but often good, retorts have to be pulled out at the beginning of a winter, lest they might break down about the season of the maximum daily make, when they cannot be dispensed with, and when there are no others to fall back upon. To prevent this loss, and gain numerous other advantages, considerable additions will require to be made to the benches of many a retort-house in Scotland.

Many great improvements have been made in the setting, heating, and working of horizontal retorts since the time our great countryman—Murdoch—applied coal gas to useful purposes, and ingenious machines have been constructed for charging and drawing them; but, unfortunately, they can only be economically employed in large works.

Gravity, the cheapest force in nature, has not been so extensively applied to the carbonization of coal as, in my opinion, it ought to. It enables the oil manufacturer to carbonize fully twice the quantity per man that we accomplish with our horizontal settings, in the ordinary way of working. At the Dumfries meeting of this Association, our worthy member, Mr. Andrew Scott, placed before us a vertical setting of retorts, which, in my opinion, contains all the conditions essential to the perfect carbonization of coal in the manufacture of gas. In this vertical setting, the heated coke of the previous charge is made to carry on the carbonization of the non-gasified products of the fresh charge, while, at the same time, poorer gases are produced by the decomposition of water, which add very considerably to the quantity and quality of the gas, by picking up the surplus hydrocarbons that flow in our present system to the tar-well, to contribute fortunes to the tar distiller. The vertical has another great advantage over the horizontal setting, in being so well adapted for the introduction of gravity to work them economically.

## Pressure on Retorts.

The fifth column of report shows the pressure on retorts to vary from  $\frac{3}{4}$  inch to 13 inches. I have no hesitation in stating that any works with anything like a dozen inches of pressure on the retort must be working at a great loss, for it is an undisputed fact, that the greater the pressure on a retort, the greater will the crop of carbon be, which not only robs the gas of its principal illuminant, but greatly retards the proper carbonization of the coal. Anti-dips prevent, to a great extent, this troublesome deposit, by reducing the pressure due to the seal, and abolishing the pulsations it produces, which Mr. Young has shown to be the principal cause of excessive depositions in highly heated retorts. Unfortunately most of the anti-dips are so liable to cause accidents, through not being self-acting, that Managers generally "rather bear the ills they have than fly to others that they know not of." I would strongly recommend for your careful perusal an able paper by Mr. Forstall, of New Orleans, read before the American Gaslight Association, "On the Advantage of Removing the Hydraulic Seal during the Distillation of Coal." It appeared in the *American Gaslight Journal* of Nov. 2, 1877, and is elaborated on data obtained from long and careful experiments, which ably support the following conclusions:—

1. With equal heats, from equal weights of coal, little or no increase of gas is obtained by the removal of the hydraulic seal, unless a vacuum is maintained in the retorts; in which case the increase is not from the coal, but from the furnace; and the loss of illuminating power overbalances the gain in volume.

2. The removal of the seal prevents effectually the excessive deposition of carbon caused by over-decomposition of the gas, and thus improves its illuminating power.

3. With an equal daily production of gas, the durability of clay retorts is nearly doubled by the removal of the seal, provided a slight pressure be steadily maintained within them during the process of distillation.

A physician must know a patient's trouble before he can properly apply medicines to effect a cure. In like manner we, knowing the bad effects of the dip, and the dangers of the anti-dips, anticipate a remedy in an apparatus that will automatically maintain a steady pressure of say one inch in the retort, and at the same time prevent pulsations. With a view to accomplish this, Mr. Young, of Clippens, has recently invented and patented a dip, which takes advantage of the pressure necessary to automatically produce a seal, to effect the precipitation of the tarry and sooty matter from the crude gases, at a high temperature, as they enter the hydraulic main, in a continuous stream, and free from any pulsatory action. Should practice prove this dip to perform its varied and important duties satisfactorily—and of that I am sanguine—it will be a most useful addition to our plant, and a step towards the perfection of a process of the utmost importance to us all.



Condensation.

The condensation columns, area, and capacity, indicate that no hard and fast line is accepted to effect the condensation of our crude gases. The annular condenser is, perhaps, the most popular. Its only advantage over the other ordinary forms is that it looks a little better, or is a trifle cheaper. Its principle of cooling the gases is identical with the others, and, consequently, of much the same value as a condenser. Our knowledge of condensation is now directing us towards separating the crude gases from the tars at high temperatures, because we know the tars have then no affinity for the hydrocarbon vapours, which they absorb and carry to the tar-well at low temperatures, as they do in the ordinary forms of condensers. The only condenser that takes advantage of this knowledge, is the Aitken and Young "Analyzer," which this Association had the honour of introducing to the gas world. Dr. Wallace, one of our most eminent chemists and gas examiners, has tested it, and declares it "an immense step in advance of anything we have had before." The tar distillers also give it an excellent testimonial for denuding the tars of the naphtha vapours, by refusing to purchase them. There is a feeling among Gas Managers generally that it is the best condenser we have yet had; but it is not, and I fear will not be, generally adopted until the patentees will guarantee a price for the tars that will, when carefully calculated, leave a fair margin of profit for diffusing the naphthas through the gas, instead of the tars. Mr. Aitken, of Falkirk, is to honour us to-day with a paper "On the Influence of Aqueous and other Vapours on Illuminating Gas." You will have observed, in the JOURNAL OF GAS LIGHTING, many able letters by M. Brémont and others on this subject, which is surrounded with much interest to us all.

Scrubbers.

It is astonishing how few works adopt the scrubber—perhaps the most profitable vessel in our plant; it not only saves much labour and material expended on the purifiers, but produces a valuable commodity, which is an item of considerable importance to the revenue of every Company who employ it.

The success that has attended liquid purification in the past, and the chemical knowledge we are ever gaining, induces me to think that the nineteenth century, famous for great discoveries, will have another added to its credit—one that will by liquids deprive coal gas of its gaseous impurities, and that in such a manner as to enable us to recover the sulphur from the sulphur compounds. The ideal of a chemical works, "that there should be no waste products," should be ours. I know three Members of this Association who are studying and experimenting in this direction of our science, and obtaining results so encouraging and satisfactory that they believe the "right track" is becoming visible, although many difficulties still blockade it. Let us hope the reward—success—that invariably attends perseverance in a good cause, will soon be theirs.

Purification.

To purify coal gas economically and well, the purifying space should be much greater than that possessed by many works represented in the report. To thoroughly utilize the purifying material, and free the gas from all impurities, it must be slowly passed through three or more purifiers. Oxide of iron does not appear to be a favourite purifying agent with Scotch Gas Managers; only a very few use it. Lime is unquestionably the best purifying agent yet discovered. Its use is, unfortunately, attended with considerable expense, and the nuisance it creates when fouled and exposed to the atmosphere are all that can be brought against it. We are to have the pleasure, to-day, of examining Mr. Hislop's process for the revivification of foul lime, which has effected great saving in the cost of lime for purification at the Paisley Gas-Works, and is, therefore, well worthy your inspection. Mr. Young has quite recently joined Mr. Hislop in patenting various arrangements of revivifying foul gas lime. The knowledge acquired through the present process, combined with the well-known ability and ingenuity of the patentees, has produced improvements whereby the cost of labour will be reduced to little, if anything, over half the cost the present system entails, and which, as I have already stated, effects "great saving." This improved apparatus of Messrs. Hislop and Young consist of a rotating cylinder of iron, lined with fire-bricks. The furnace for effecting the calcination of the lime is placed at one end, and the liberated gaseous impurities are drawn off at the other into a flue leading to the chimney stalk. The cylinder is slightly inclined to the furnace end, which causes the foul lime, which is charged at the higher end, to travel slowly the length of the cylinder. The rotary motion has a further advantage of turning the lime, and continuously exposing fresh surfaces to the action of the heated products of combustion from the furnace, which very much facilitates the liberation of the gaseous impurities. This will, in my opinion, almost dispense with manual labour, and secure great certainty of action. Any process that will revivify our waste lime at a small cost will be an immense saving to Gas Companies, until that time when liquids will supersede lime for gas purification.

You will be pleased to see from the programme that Mr. D. M. Nelson is to favour us with a paper on "Steel's Improved Apparatus for Purifying and Condensing Gas." I am not acquainted with this patented process, but I know, when Mr. Nelson undertook to bring it before you, that it will possess good points, and be the means of provoking an instructive discussion.

Pressure on Mains.

The day and night pressures suggest the great saving effected by governors. There is, I believe, no instrument connected with our industry for which more patents have been granted than the governor. I have found, from experience, Peebles's Patent Safety Governor to be a most reliable regulator of the pressure, and to possess, in its ingenious construction, the minimum of risks in regard to accidents. Foulis's Patent Governor, which is exhibited here to-day by the sole manufacturers, Messrs. W. and B. Cowan, is now in successful operation, both as a station and district governor, and found to be a most efficient instrument in either position. It possesses, like the governor already mentioned, advantages over its many predecessors with unprotected holders, in not being liable to pulsate, and in being proof against escapes of gas, that prove so disastrous to many works. A few months ago, Mr. Foulis invented a lamplighter and extinguisher, which was found, by experiments made in Glasgow on lamps 300 feet apart, to act not only as an efficient lamplighter and extinguisher, but also to perform the important duty of a street-lamp regulator. In this invention Foulis's patent governor plays the leading part. Mr. Scott will have the honour—through Mr. Foulis's kindness—of showing you the clever invention at work. For further information regarding it, I would refer you to the JOURNAL OF GAS LIGHTING, where a description of it will shortly appear. This mechanical lamplighter, &c., overcomes a great difficulty in being competent to light, extinguish, and regulate the consumption of gas in many street-lamps from a central position. I understand Mr. Foulis is not sanguine of great profits being made through its adoption. It settles the question, however, Can it be done? But I fear until the mechanical lamplighters, &c., can clean the lamp globes, and so dispense with the present lamplighters altogether, that their advantage will be trifling. Allow me, while on this subject, to remark that I believe the streets of London will be lighted by the electric light before electricity will light and extinguish gas street-lamps economically. Mr. Foulis lately added another to his numerous

list of inventions—a street-lamp governor. The beauty of this instrument is that the pressure, or rate per hour, can be regulated by adjusting a ball, screwed on a small lever, without taking the governor to pieces.

Leakage, or Gas Unaccounted for.

I find, from the returns made under this head, that the leakage was as low in one works as 6 per cent., and as high in another as 28 per cent. There are many points in our system to which this loss can be traced. I would recommend all who have not a thermometer fixed in the inlet of the station-meter to get one, and should your condensing power be deficient, you will find a considerable proportion of the unaccounted-for gas due to its being registered at a higher temperature than what it was afterwards sold at. Main-pipe joints, connections, and old service-pipes contribute much to this loss, but certainly not more than old wet and dry meters. I find the ordinary wet meter, when watered four times a year, more profitable than the majority of dry ones. Mr. Dalziel, of Kilmarnock, is to honour us with a paper on "Non-Tilting Meters." This subject has long been a study of Mr. Dalziel's, and is one of great importance to all interested in the reduction of unaccounted-for gas.

Illuminating Power.

The illuminating power of the gas manufactured north of the Tweed varies from 24 to 33 standard candles. I am not in favour of reducing our standard to 20 candles. We must keep pace with the spirit of the age, and continue improving our artificial light, which the customs and amusements of society have rendered indispensable. The standard in England is year after year improving; and whenever the London Companies get over the sulphur difficulty, the public cry will doubtless be for higher illuminating power, and the Companies will, in all likelihood, comply with the demand, as they have ever done in the past. We cannot consider our process of gas manufacture complete until we can diffuse permanently through the gas all the naphtha vapours that are produced during the carbonization of the coal.

Mr. Young's lecture on "Carburetted Gas" will doubtless enlighten us all on a process that may soon be required either to raise or maintain our high standard of illuminating power.

Before closing my remarks, I wish to draw your attention to the benefits secured by receiving deposits from all consumers—say, equal to four months winter consumption. A satisfactory feeling can never exist between consumers and gas companies or corporations while the latter charge deposits from one section of the community, and allow the other—considered respectable—to go without them. I consider it unfair to continue the present system. It is wrong to make respect of persons, without there is sufficient cause. The test of a man's respectability or honesty, in the system generally adopted, is the number of apartments in the house he occupies. We all know that this is a most unsatisfactory test; for our experience teaches us that honest men live in the humble, as well as the higher, walks of life. From the ranks of consumers—considered respectable—without deposits, the bulk of bad debts accumulate; therefore, the consumers with deposits are discontented, and justly so, because they have to pay a proportion of these bad debts in being charged more for gas than they ought to be if all were placed on the same footing as regards deposits. Four, or even five, per cent. should be allowed on all deposits lodged for upwards of a year, and the interest paid, say, every three years after the deposit was lodged. By receiving deposits from all consumers they become shareholders in the undertaking, the bad debts are reduced to a mere trifle, and the time and trouble collectors have in hunting up defaulting consumers are greatly reduced. As an instance of how bad debts are got rid of, I may say that a corporation adopted the system of charging deposits from all consumers a few years ago, and they, for the nine months ending February, 1878, have now less than 2s. per £100 of bad debts.

Seeing we have a long and interesting programme to discuss, I will not detain you longer than to thank you for the patient hearing given me, and ask you to freely express your opinions on the subjects brought before the meeting for discussion.

On the motion of Mr. BLACK (Alexandria) a hearty vote of thanks was accorded to the President for his interesting Address.

Mr. H. AITKEN (Darroch) read the following paper:—

ON THE INFLUENCES OF AQUEOUS AND OTHER VAPOURS ON ILLUMINATING GAS.

Feeling a want of information upon certain points that arose in the working of what is known as the Aitken and Young process of gas-making, and being unable to obtain it, I have had during the last few years the following series of experiments made to determine the influences of the following substances in 25 to 27-candle gas—viz., benzole, atmospheric air, and aqueous vapours.

1. To determine the influence of benzole in the gas, I passed the gas over benzole of commerce contained in a tube, and the following are the results:—

	Gas before coming in contact with the Benzole.	Gas after having passed over Benzole.	Gain.	Grains of Benzole by Weight to the Cub. Foot of Gas.	Grains of Benzole per Candle of Increase.
First Trial.					
Benzole of commerce	25 candles.	29.6 candles.	4.6 candles.	13.85	3
Second Trial.					
Benzole of commerce	27 "	31.62 "	4.62 "	18.87	8

Thus 2 gallons of benzole increase the illuminating power of 10,000 cubic feet of gas 4 candles.

	Gas before coming in contact with the Naphthas.	Gas after having passed over Naphthas.	Gain.	Grains of Naphtha per Candle of Increase.
Third Trial.				
Light naphthas	28.1 candles.	29.76 candles.	1.66 candle.	2.4

Thus 1.6 gallons of naphtha increases the illuminating power of 10,000 cubic feet of gas 4 candles.

In this last experiment the gas was passed over the crude naphthas, also enclosed in a tube. In all the trials the gas was passed over the benzole or naphthas immediately before going to the burner.

In making these experiments, a small amount of white matter was precipitated into the benzole that remained, but the quantity was too small to determine its character.

No doubt the influence of benzole or naphthas on gas of, say, 15 candles would be more marked; but not having this gas at command, no experiment could be made.

The great increase in the illuminating power got by using crude naphthas, compared with that got from the benzole of commerce, proves that the gas not only absorbs the benzoles from the naphthas, but also a considerable quantity of the heavier hydrocarbons, and that these have a greater illuminating power than pure benzole.

The practical lesson to be drawn from these experiments is that the tars,



as presently condensed, contain not only benzole, which, when properly condensed, should pass away with the gas, but also other hydrocarbons, even more valuable as illuminants, and also that when cold these heavier hydrocarbons can be taken up from the gas. This accounts, to some extent, for the high results got in working the Aitken and Young process. The general idea was that the only illuminants taken by the process from the tars were the benzoles.

2. To determine the influence of atmospheric air, I made experiments with the following results:—

*Gas before being charged with Air, 27·82 Candles.*

Gas with	1 per cent. air added,	27·15 candles	Loss.	Loss per Cent.
"	1	"	26·59	" 1·23
"	5	"	23·73	" 4·09
"	10	"	20·80	" 7·02

As the quantity of air added diminishes the gas burned (the gas and air were mixed before passing through the meter), it is necessary to correct this table, so as to show the loss resulting from the quantity of gas, and not the mixtures actually consumed. The following table shows this:—

With	1 per cent. air	27·15 candles	+ 1/10	14 = 27·29 candles	Loss.	Loss per Ct.
"	1	"	26·59	"	+ 29	27 = 26·86
"	5	"	23·73	"	+ 19	25 = 24·98
"	10	"	20·80	"	+ 9	21 = 21·11

*Properties of Saturated Mixtures of Air and Aqueous Vapour under a Constant Pressure of One Atmosphere, or 14·7 lbs. per Square Inch, at Temperatures of from 32° to 212° Fahr.*

Final Temperature of the Saturated Mixture or Dew-point.	Total Pressure per Square Inch.		Weight of 100 Cubic Feet.		Quantity of Heat in 100 Cubic Feet, reckoned from 32° Fahr. (Water at 32° for Vapour.)			Quantity of Heat in One Pound of Vapour, reckoned from Water at 32° Fahr.	Quantity of Dry Air required for One Pound of Vapour in Saturated Mixture.		Required Initial Temperature of the Dry Air to Evaporate One Pound of Moisture in Saturated Mixture.	
	Vapour.	Air.	Vapour.	Air.	Saturated Mixture.	Vapour.	Air.		Saturated Mixture.	Weight.		Volume at 62° F.
Fahr.	lbs.	lbs.	lbs.	lbs.	lbs.	Units.	Units.	Units.	Units.	lbs.	Cubic Feet.	Fahr.
32 degs.	·089	14·611	·031	8·023	8·054	33·8	0·0	33·8	1091·2	258·8	3401	49·7
35 "	·100	14·600	·034	7·970	8·004	37·1	5·7	42·8	1092·1	234·4	3080	54·6
40 "	·122	14·578	·041	7·879	7·920	44·8	15·0	59·8	1093·6	192·2	2526	63·8
45 "	·147	14·553	·049	7·785	7·834	53·6	24·1	77·7	1095·1	158·9	2088	74·0
50 "	·178	14·522	·059	7·693	7·752	64·7	32·9	97·6	1096·6	130·4	1714	85·4
55 "	·214	14·486	·070	7·598	7·668	76·8	41·5	118·3	1098·2	108·5	1426	97·6
60 "	·254	14·446	·082	7·507	7·589	90·1	50·0	140·1	1099·7	91·6	1203	110·5
65 "	·304	14·396	·097	7·410	7·507	106·8	58·1	164·9	1101·2	76·4	1004	125·6
70 "	·360	14·340	·114	7·311	7·425	125·6	64·1	189·7	1102·8	66·0	868	140
75 "	·427	14·278	·134	7·208	7·342	147·9	73·7	221·6	1104·3	55·0	723	160
80 "	·503	14·197	·156	7·106	7·262	172·5	81·1	253·6	1105·8	45·6	599	182
85 "	·592	14·108	·182	6·996	7·178	201·6	88·1	289·7	1107·3	38·4	505	206
90 "	·693	14·007	·212	6·896	7·108	235·1	95·1	330·2	1108·9	32·5	427	233
95 "	·809	13·891	·245	6·764	7·009	272·1	101·3	373·4	1110·4	27·6	363	264
100 "	·942	13·758	·283	6·641	6·924	314·7	107·3	422·0	1111·9	23·5	308	299
105 "	1·095	13·605	·325	6·505	6·890	361·8	112·9	474·7	1113·4	20·0	263	344
110 "	1·267	13·433	·373	6·368	6·741	415·8	118·1	533·9	1115·0	17·1	224	385
115 "	1·462	13·238	·426	6·224	6·650	476·4	122·7	599·1	1116·5	14·6	192	436
120 "	1·685	13·015	·488	6·063	6·551	545·6	126·8	672·4	1118·0	12·4	163	499
125 "	1·932	12·768	·554	5·900	6·454	620·1	130·4	750·5	1119·5	10·7	140	567
130 "	2·215	12·485	·630	5·717	6·347	706·2	133·2	839·4	1121·1	9·1	118	667
135 "	2·542	12·158	·714	5·524	6·238	801·5	135·2	936·7	1122·6	7·74	102	745
140 "	2·879	11·821	·806	5·325	6·131	906·0	136·7	1042·7	1124·1	6·61	86·8	856
145 "	3·273	11·427	·909	5·106	6·015	1023·4	137·2	1160·6	1125·6	5·62	73·8	986
150 "	3·708	10·992	1·022	4·869	5·891	1151·8	136·6	1288·4	1127·2	4·77	62·6	1,145
155 "	4·193	10·507	1·145	4·619	5·764	1292·3	135·1	1427·4	1128·7	4·03	53·0	1,332
160 "	4·731	9·969	1·333	4·346	5·679	1506·5	132·2	1638·7	1130·2	3·26	42·8	1,618
165 "	5·327	9·373	1·432	4·055	5·487	1620·6	128·2	1748·8	1131·7	2·83	37·1	1,847
170 "	5·985	8·715	1·602	3·739	5·341	1815·0	122·6	1937·6	1133·3	2·33	30·7	2,212
175 "	6·708	7·992	1·774	3·402	5·176	2013·1	115·6	2128·7	1134·8	1·92	25·2	2,665
180 "	7·511	7·189	1·970	3·036	5·006	2239·0	106·8	2345·8	1136·3	1·54	20·3	3,280
185 "	8·375	6·325	2·181	2·651	4·832	2481·7	96·4	2578·1	1137·8	1·22	16·0	4,124
190 "	9·335	5·365	2·411	2·231	4·642	2747·0	83·8	2880·8	1139·4	·93	12·2	5,368
195 "	10·385	4·315	2·662	1·781	4·443	3037·0	69·0	3106·0	1140·9	·67	8·8	7,370
200 "	11·526	3·174	2·933	1·300	4·233	3350·6	51·9	3402·5	1142·4	·44	5·8	12,840
205 "	12·770	1·930	3·225	0·785	4·010	3689·5	32·3	3721·8	1143·9	·24	3·2	19,985
210 "	14·126	·574	3·543	0·232	3·775	4058·2	9·8	4068·0	1145·5	·065	·86	73,940
212 "	14·700	·000	3·683	0·000	3·683	4221·1	0·0	4221·1	1146·1	—	—	—

The power of the gas to retain naphthas is also increased by increased temperature. It would be perfectly useless to dry gas, and then pass it through a wet meter, particularly if, after that was done, the gas was subjected to a temperature below 32°. Besides the gas would soon take up all the water in the meter.

The advantage of drying gas may not be one of very great moment in a climate like ours, and with such gas as we have; but, in countries where the temperature is very low, it is a matter of great consequence, as it enables the gas to retain larger quantities of benzole, naphthaline, and other hydrocarbons. To determine this point, I had a long series of experiments made, and found that undried gas, at a temperature of 50°, absorbed only a quarter of the quantity of benzole that dried gas did, and that when these gases were reduced to a temperature of 32°, the undried gas lost or dropped down nearly 80 per cent. of the naphthas it had absorbed, whereas the dried gas dropped less than 12 per cent.

The naphthas used in these experiments were extracted from coal gas by means of heavy oil, and then distilled for separation, and their specific gravity ranged from ·808 to ·890. After the gas had passed over these naphthas, there was a marked increase in the specific gravity. The ·808 had risen to ·812, and the colour of the naphthas was considerably darker. On the temperature of 25 to 27 candle gas being reduced to 32° it drops equal to 7000 grains of naphthas or benzole to 10,000 cubic feet (along with the quantity of water due to the change in temperature), and according to the foregoing experiments this means a loss of illuminating power of about a quarter of a candle.

These experiments were made by passing the gas through two jars, 6 inches by 7 inches, the gas being let in at the top, and out, through a tube, from the bottom.

The jars were kept immersed in a freezing compound, and the gas brought off as nearly as possible at 32°. In this way there was a continuous current through the jars. This brings me to another important point—viz., the influence of current, or the want of it, on the dropping down point of naphthas. The experiments undertaken with the view of determining this are not yet completed, but they are sufficiently advanced to enable me to say that 25 to 27 candle gas, at a temperature of, say, 40° to 50°, will in a current not only not drop down its naphthas, but will, on the contrary, lick up a very considerable quantity, and hold it so long as motion continues.

One curious feature in the experiments made to determine this is the

These results show that the influence of a mixture of air in 27-candle gas is not so detrimental as one would have supposed. It is also to be noted that the deterioration does not proceed in equal ratio with the quantity of air added, a result I certainly was not prepared for.

3. To determine the influence of aqueous vapours the following experiments were made. The gas was dried by being passed through a tube containing fragments of anhydrous chloride of calcium.

The gas before being dried was 27·24 candles, and when dried 27·46, an increase of ·22 candle. The gas was measured before being dried, and no doubt was completely saturated with aqueous vapour, both from the holder, the meter, and the governor.

The temperature of the water in these was 59° Fahr., which gives a tension of aqueous vapour (when saturated) of 13 millimetres out of a total of 760 millimetres of the barometer. This is 1·71 per cent. by weight, or almost 2·8 per cent. by volume. By drying, therefore, there is a loss of 2·8 per cent. in the volume of the gas, and a gain of ·8 per cent. in the illuminating power. This is not a gain worth fighting for *per se*, but the advantage of drying gas will be further alluded to. No doubt the advantage of drying poor gases will be very much more marked than rich, but I have had no opportunity of testing them. Of course you are aware that the power of gas to absorb and retain aqueous vapours increases in proportion to the temperature, and I incorporate here, in illustration of this, a table from "Dr. Clark's Manual of Rules, Tables and Data for Mechanical Engineers," showing the quantities of aqueous vapours contained in air at different temperatures.

unexpected compounds that drop from the gas while in a state of rest or partial rest. At one time they are black substances like clotted blood, at another they are white, and sometimes they are partly both. The black substance sinks in water, while the white does not; but their chemical composition I have not yet determined, not having got sufficient quantity to operate on.

I think these experiments are sufficiently advanced to enable me to say that the deposition of the naphthas on the water in the gasholders may be almost, if not entirely, prevented, by placing on the top of the outlet-pipe from the gasholder a dome, or an arrangement like a flat umbrella, so that the gases, before leaving the gasholder, may go down to within a few inches of the water, and so lick up any naphthas that may have been deposited on its surface, and that the pipes to which the drip-boxes in the streets are connected should be made flat in the bottom, and that the pipe connecting the drip-boxes with them shall be placed at the very bottom, so as to allow the water to be pumped off first. In this way I expect that in most situations any naphthas that drop from the gas (so long as the temperature does not come below, say, 35°) would be carried off by the gas so soon as it got into motion; the quality of the gas remaining uniform.

The experiments I have made on the influence of steam put into gas, and thereafter condensing it, show results, so far as I have gone, so conflicting that I will require to repeat them on a larger scale and with apparatus more complete.

My time being much occupied otherwise, I had to get others to perform most of the experiments—viz., Dr. Wallace, of Glasgow, and Mr. M'Alley, of Falkirk. Indeed, these gentlemen performed nearly the whole of the experiments, and they therefore carry much more weight than if they had been made by myself in those short intervals we call leisure.

Mr. DAVIDSON (Dawsholm): I should like to ask Mr. Aitken whether he has made experiments as to the permanency of the increase in illuminating power through the use of benzole, and whether, if the gas has to travel a considerable distance, there is no difference in the increase at its utmost limit.

Mr. HISLOP: I have listened with great interest to this paper to-day. I can corroborate Mr. Aitken's remarks on the matter of the absorption by gas of those hydrocarbons deposited on the surface of the water in the tanks and drips in the streets. A number of years ago a chemical manufacturer called upon me, and represented that he had discovered a very large quantity of benzole floating on the water inside the gasholders, and



he brought a special pump to prove the existence of the oil, and really it was found to the depth of five-eighths of an inch in the gasholder. After consideration of the subject, I conceived that there would be no gain in pumping up these oils by the means he suggested, as I guessed that they would be utterly useless. In the summer, however, I found that the whole of the benzole had disappeared. There was not a single vestige of it to be found on the surface of the water in the gasholder. It, therefore, seems that the gas drops these oils in the winter months, and that in the summer it takes them up again, when the temperature is higher, and the gas in that condition to which Mr. Aitken has referred, and the illuminating power of the gas is thereby increased. The same thing might be said about the drips, if there was any convenient means of lifting the oils out. But I see some difficulty in putting the diaphragm into the drips, so as to compel the gas to go down. There might be a danger of the oils flowing up, and putting some sections of the town into sudden darkness. I can, in the main, however, corroborate the views of Mr. Aitken as to the quality of the gas after taking up these hydrocarbons, as that is quite within my experience, and I believe, in the case of a town where the drips in the mains are not large, the same thing will take place, and the illuminating power of the gas in summer will be increased by the deposit in winter. It is a fact within my experience that we can give higher illuminating power of gas in summer than in winter, and I believe it is altogether attributable to this fact, that the gas takes up in summer a large portion of the hydrocarbons which have been deposited in cold weather. Upon the whole, I think that Mr. Aitken has contributed some very important matter to the science of gas lighting, in showing the effect of dry gas, and its power of retaining those hydrocarbons. I propose a hearty vote of thanks to Mr. Aitken for his paper.

Mr. DALZIEL: I can corroborate Mr. Hislop in his remarks about the oil being deposited on the surface of the water in the holders. During the winter a quantity of greasy matter gathers inside the holders, and I have further noticed that in summer weather, by putting in low-class coals, equal to 23 or 24 candles, the illuminating power was equal to winter. The only reason I could give for this phenomenon, which I have noticed for years, is, that the hydrocarbons stored and collected during winter were absorbed by the gas during summer, and made use of then. I think if naphthas are deposited at one time of the year they are taken up at another.

The PRESIDENT: I suppose the reason why no other Member desires to speak is, that we are all agreed upon what Mr. Aitken has said, and think that he is on the right track. I will now ask Mr. Aitken to reply.

Mr. AITKEN: In answer to the question of Mr. Davidson as to the permanency of the gas after the absorption of the benzole, I should explain that the experiments were not made with the view of ascertaining that. They were made to ascertain correctly how much benzole it takes to increase 10,000 feet of gas a candle, or four candles, or whatever it might be; or, to put it otherwise, to see how many gallons of benzole it would require to increase the illuminating power of ordinary 25-candle gas four or five candles, and to see what was the effect of a given quantity of benzole with a given quantity of gas. Perhaps people hold different opinions upon the power which the gas might have to carry off the benzoles. As I apprehend, it depends upon the temperature. It may be, however, that if the gas comes out of the holder cold, and, after passing into the streets, gets heated, it would certainly have the power of permanently carrying benzole naphthas along with it. If, on the contrary, when the gas reached the pipes the temperature was reduced, I have no doubt the gas would drop the benzole. It is entirely a question of temperature. What Mr. Hislop said, about gas in summer being richer from the hydrocarbons picked out of the gasholder, is quite true. By the deposition of these hydrocarbons in the winter an advantage is obtained in summer, but it is not in the summer that you want this advantage most. Winter is the worst time to keep up a good quality of gas, and by dropping the benzole in winter you drop it at the very time when it is most required. Then, as pointed out by Mr. Dalziel, not only is the benzole on the top of the water, but benzole covers every pipe, and, of course, in summer the gas has not only to take the benzole off the top of the water, but it has to wash the benzole off all the surface pipes, or, at all events, every pipe where a deposition has been made when the temperature was low. I do not suppose you will get this deposition to a great extent in houses, unless the gas is made from shale at a low temperature, when I know the naphthas, or benzole, or whatever other term you may apply, settle down at a higher temperature than those made by ordinary coal gas.

The vote of thanks proposed by Mr. Hislop to Mr. Aitken for his able paper was cordially given.

(To be continued.)

## THE USE OF WATER AS A MOTIVE POWER.

By Mr. JOSEPH PARRY, C.E.

[A Paper read before the Liverpool Polytechnic Society, Dec. 17, 1877.]

Many centuries before Hero invented the Æolipile, and before the Saracens constructed a wind-mill, water power was employed to drive corn mills on the banks of the Nile and Euphrates, and to irrigate the rice fields of China. History does not tell us, and even tradition is silent, as to the time when water was first used as a motive power; but, although a knowledge of the means of deriving useful work from an element so widely diffused, has been so long before the world, and much ingenuity was displayed in remote ages in connection with its application, it was not until a few years ago that any great improvement was effected, and substantial progress was made.

The wave of mechanical invention that passed over this country during the latter half of the last century did not contribute much to the advancement of hydraulic machinery. The discoveries of Watt, and the cheapness of coal, attracted so much attention to the use of steam, that every other class of machinery was almost entirely neglected.

Joseph Bramah, the inventor of the hydraulic press, appears to have been the first to suggest the application of water pressure "to convey motion and power to the cranes on dock quays and elsewhere, and for raising and lowering goods in and out of warehouses." But it is to Sir Wm. G. Armstrong that the modern development of water pressure machines is almost entirely due; and he has recently, in an interesting paper read before the Institution of Civil Engineers, related how his attention was first directed to the subject. Sir Wm. G. Armstrong, who is now a Vice-President of the Institution of Civil Engineers, and a Past President of the Institute of Mechanical Engineers, was formerly a solicitor. When travelling through the valleys of the Craven district of Yorkshire, he was led to observe the numerous rills descending the steep slopes of the surrounding hills, and expending their energy in the production of foam. He found it was seldom that any attempt was made to utilize the power thus bountifully provided, and that where such attempts were made, the amount of work realized was very small in proportion to the extent of fall available. He was, therefore, led to consider how such falls might be

made more productive, and he succeeded in devising a machine consisting of a "wheel with a flat rim, containing four equidistant pistons folding into circular apertures, and intersecting longitudinally a curved tube open at the lower end, and communicating at the upper end with the supply-pipe. The pistons open out as they enter the tube, and fold upon leaving it; and each piston takes the pressure of the column before the preceding one loses it. The opening and closing of the pistons, in the order required, is effected by external cams and slides, giving motion to the pistons through the axles on which they turn."\*

A working model of this machine was made and tried in Newcastle, and gave an efficiency of 90 per cent. of the theoretic power of the head employed. Having applied his mind to the subject, his views soon extended, and assumed a practical form in the erection of a hydraulic crane on the Newcastle Quay. Subsequently two cranes, which are still in operation, were erected at the Albert Dock, Liverpool, and worked by pressure from the Corporation mains. About the same time Sir Wm. Armstrong abandoned the legal profession, and devoted himself entirely to engineering.

The purposes to which water is now applied as a motive power, and for the transmission of power, are so numerous, that it would be impossible to deal satisfactorily with the whole of the subject within the limits to which I must confine myself to-night. I propose, therefore, to restrict my remarks almost exclusively to that branch of the subject which relates to the direct use of water pressure from the water-works mains in Liverpool.

No paper under the title which I have chosen would be complete without some reference to the vast energy that is to be found in the river to which Liverpool owes so much of its importance. I shall merely remark, in passing, that the question of utilizing the rise and fall of the tide, or the rotation of the earth, for driving machinery, is so large and interesting that it deserves to be separately treated, and on some future occasion I may perhaps return to it.

It is no part of my present object or intention to discuss the comparative merits and economy of different prime movers, or to attempt to assign to water power its relative position among the many claimants for adoption. There are engineers who advocate and urge the universal application of a particular class of machinery, or a particular kind of power, in the success of which they are generally more or less interested. They are like certain doubtful professors of the art of healing who have one remedy for the cure of every disease. The skilful physician, on the contrary, studies the symptoms of every case in which he is called upon to prescribe, and adapts his treatment to the nature of the malady and the physical state of the patient. In the same way it is the duty of the engineer to consider the special circumstances and conditions of every case upon which he is consulted, and, having regard to all those circumstances and conditions, to select the means which are best adapted to accomplish the work that has to be performed. What is really important to him is to have trustworthy data upon which to base his calculations and conclusions, and to guide him in the application of general principles. The results which will be laid before you, of experience extending over a somewhat wide range of practice, may be of some service in the way thus indicated. At the same time I shall endeavour to give such general information on the subject as may be of interest to those who do not possess any special knowledge of water pressure machinery.

### Present Use of Water for Power from the Liverpool Corporation Mains.

In considering the use of water pressure from the Corporation mains as a motive power, and the extent to which it is possible to make further applications of the same kind, it may be desirable at the outset to inquire what are the resources which we have at command.

The existing works of the Corporation are estimated by the Borough and Water Engineer to be capable of supplying about 18½ million gallons, or 81,632 tons, of water per diem. This volume can be delivered from the mains at pressures ranging from 20 lbs. per square inch to 80 lbs. per square inch. At the average pressure available throughout the district of supply each 1000 gallons of water distributed represents, if fully utilized, an ability to produce mechanical work of about 410 foot-tons. In the lower parts of the town, where most of the business premises are situated, the average pressure is much higher than the average over the whole district of supply, and each 1000 gallons of water represents about 560 foot-tons. If this were converted into work through machinery giving an efficiency of only 75 per cent., the value in foot-tons of each 1000 gallons would be about 420.

The price at which water is sold in Liverpool for trade purposes is 9d. per 1000 gallons.

The cost of water per horse power per hour within a line drawn at a distance of one mile from, and parallel to, the river varies from 11d. to 1s. 3d.

I now proceed to inquire, What is the actual consumption of water in Liverpool at the present time for purposes of power? The following statement gives the number of gallons distributed during the last twelve months:—

	Gallons.
For hydraulic hoists and cranes . . . . .	44,542,290
For organ blowing . . . . .	8,624,000
Miscellaneous . . . . .	657,000
Total . . . . .	48,823,290

### Lifts and Hoists.

These may be divided into three classes, according to the character of the apparatus through which the power is communicated.

The direct-acting lift is the simplest form employed, and gives the highest co-efficient of useful effect. It consists of a cylinder and ram, to the top of which is attached a platform, cage, or room, supported on iron brackets. The height of the lift is thus determined by the length of the stroke of the ram; and the area of the ram, multiplied by the available head of water in the cylinder, is the measure of the power of the lift. The cylinder is usually fixed in a well, or bore-hole, sunk for the purpose; and where the height of the lift is considerable, the cost of sinking the well, or hole, and the difficulty of access in the event of repairs being required to the cylinder—which, however, is of very rare occurrence—are objections to this otherwise desirable and popular arrangement. The supply of water is admitted to the cylinder from the water-works main, and the platform or room ascends until stopped by the closing of the supply-valve. The same operation opens the exhaust, and the platform or room descends by its own weight.

Lifts of this description are much in favour for the conveyance of passengers, because of the smoothness with which they run, and the absolute impossibility of any accident taking place. The rooms in which the passengers are conveyed are often luxuriously furnished.

Hoists with multiplying gear are generally adopted where the travel exceeds 20 feet. They consist of—(1.) A cylinder and ram similar to those described above, but instead of the platform or cage being attached to the top of the ram, multiplying sheaves are used in the inverted order of pulleys and blocks. A chain is usually carried from a pulley fixed in a bracket cast on the cylinder side over sheaves working in a cross-head

\* Letter to Mr. Thomas Mallet, Nov. 10, 1862. Vide Minutes of Proceedings of the Institution of Civil Engineers, Vol. xlix., p. 30.

† Vide Proceedings of the Institution of Civil Engineers, Vol. I., p. 64.

\* Vide Proceedings of the Institution of Civil Engineers, Vol. I., p. 64.



keyed to the top of the ram, and up to a sheave at the top of the shaft, above the highest point of the lift. (2.) Another arrangement, of which there are only a few examples in Liverpool, consists of a cylinder and piston working a rack-and-pinion motion. The hoist is actuated by a rope or chain winding on a flanged wheel fixed on the end of the pinion shaft, and communicating with the cage over sheaves.

There are in Liverpool several instances of hoists worked by rotary engines, and engines of this type are becoming more in favour. Various kinds of engines with oscillating cylinders are in use, and recently two of Brotherhood's three-cylinder engines have been fixed. In all these cases the engine takes the place of the cylinder and ram, and communicates motion by a rope or chain. The pattern recommended by Sir William Armstrong, where there is sufficient space, is a two-cylinder oscillating engine, fitted with combined rams and pistons, working on over-end cranks placed at right angles to each other.

The non-elasticity of water, which is such a valuable property as a means of accumulating and transmitting energy becomes a source of danger when, a column having been set in motion, it is suddenly arrested by the closing of a valve or the termination of a stroke. To obviate this danger, and prevent injury by shocks and strains to the machinery and mains, it is necessary to provide capacious air vessels, or relief valves, in connection with all water pressure machinery. The neglect of this precaution has frequently been the cause of serious damage. The relief valves introduced by Sir William Armstrong are small clacks opening against the pressure in the supply-pipes, and yielding readily whenever any undue increase in the pressure takes place.

Several forms of inlet and exhaust valves are in use. They are chiefly of two kinds—slide valves, and equilibrium mitre valves. Owing to the difficulty of moving slide valves of a large area, it is usual to make the ports small, in proportion to the area of the pipes to which they are attached, thus increasing the velocity of the water at that point, and often causing considerable loss through friction. It is essential to have the valves constructed so as to close gradually, and avoid producing a concussion in the supply-pipes.

The equilibrium mitre valves are the most satisfactory that have yet been introduced, from the ease with which they can be moved, and the area of opening they afford.

The valves of hoists are actuated through levers by a rod, chain, or rope, passing up the shaft at one side of the platform or cage. A slight pull suffices to stop the hoist at any point during ascent or descent. The floors of the hoists are usually fitted with tappets arranged to strike upon projecting bars or pieces on the valve pull. This contrivance renders it impossible for any damage to be done by neglect in shutting off the water at the proper moment.

As a provision against the possible breaking of the lifting chain or rope, hoists of classes 2 and 3 are generally furnished with a safety appliance to prevent the room or platform falling more than two or three inches under any circumstances. Strong safety ratchets are carried up the sides of the shaft from a firm bearing at the bottom to the highest point of the lift, or the ordinary guide timbers are made to answer the same purpose. The safety appliances consist of heavy iron pawls, cams, or eccentric ratchet wheels, combined with powerful steel springs. In ordinary work the springs are held in tension, but in the event of the rope or chain breaking, the springs, relieved of their weight, would immediately force the pawls, cams, or eccentrics into contact with the safety ratchets or guide timbers, and remain locked there until the load was again raised.

Compensating counter-balances are of two kinds—

1. Where the weight of the counterpoise is equal to that of the cage or platform and ram, and is connected by a rope carried over a pulley at the top of the shaft; the space passed through being equal for both.

2. Where the weight of the counterpoise is double that of the cage or platform, and acts on a drum keyed on the same axis as another drum of twice the radius, so that the space travelled by the counterpoise is half the height of the lift.

The speed at which hoists are worked varies from 50 to 150 feet per minute.

The following statement gives, in a tabular form, information with respect to a few cases which have been selected as fair average examples of machines of various types and by various makers:—

Description of Lift.	Diameter of Ram or Piston.	Length of Stroke.	Height of Lift.	Maximum useful Load in actual Practice.	Pressure in Main in Pounds per Sq. Inch.	Cost per Lift for Water only, in Pence.	Cost per Ton raised One Foot, in Pence.	Total Cost per Annum for Water.
A. Direct-acting ram lift.	18½	21 2	21 2	30	50	2.18	.068	12 3 9
B. Direct-acting ram lift.	13	15 3	15 3	20	54	.78	.051	6 5 9
C. Direct-acting ram lift.	8½	50 10	50 10	15	57	1.18	.030	105 7 1*
D. Multiplying piston.	24	7 0	58 0	15	52	1.23	.028	120 8 3†
E. Ditto ram.	23½	4 3	40 0	6	67	.71	.059	69 19 6
F. Ditto piston.	19	10 0	72 0	7	68	1.09	.043	60 0 9
G. Ditto ram.	21	4 3	57 6	7	68	.56	.028	10 14 6
H. Ditto ram.	23½	6 6	76 0	10	56	1.09	.028	16 6 3‡
I. Ditto ram.	23½	6 4	36 0	10	50	1.06	.059	63 9 0§
K. Ditto ram.	18½	7 3	57 6	7	74	.75	.037	22 10 9
L. Two-cylinder oscillating, E.	4	0 9	50 0	4	69	—	—	14 17 0
M. Rack-and-pinion piston.	16½	6 6	37 0	3	44	.54	.097	3 8 3
N. Rack-and-pinion piston.	18½	9 0	46 0	6	75	.93	.067	20 5 9
O. Rack-and-pinion piston.	19½	6 2½	51 0	10	71	.72	.026	—

The load given in column 5 is the maximum load actually raised in the ordinary course of work. It has been ascertained by inquiry from the persons in charge of the machines, and must not be taken as representing their full power. The full power has, however, been obtained by experiment in three of the cases, and is given in the notes to the table.

No counterbalance is provided for any of the direct-acting lifts, except the passenger lift; therefore the weight of the platform and ram must be added to the load stated in the table in order to arrive at the total weight lifted by the water.

As to the cost of erecting this class of hydraulic machinery, the following particulars, having reference to work recently executed, may be of interest:—

The total cost of the hoist marked H, including the connection with

the main, was £394. This hoist is in daily use in a Wine and Spirit Merchant's establishment, and the average cost per working day for water is 11.4d.

The hoist marked O cost £168, including the communication-pipes, but not including the cage. A 10 cwt. hoist, fixed within the last few weeks, cost, including communication-pipes, £376. The dimensions of this hoist are—Diameter of ram, 23½ inches; stroke, 7 feet 6 inches; lift, 69 feet; and the speed is 170 feet per minute.

The total number of lifts and hoists supplied from the Liverpool Corporation mains is 70.

#### Variation of Load.

One of the objections to water-pressure machinery is that water, not being, like steam, capable of expansion, the power expended does not vary in proportion to the load to be raised or work to be accomplished; therefore, waste takes place where the maximum capacity of a machine is not exerted. There are, however, several ways in which loss from this cause may be partially, if not entirely, prevented.

1. By employing two or more pressure cylinders, so arranged that they may be made to act separately or collectively upon the lifting chain.

2. By a combined piston and ram; the proportion between their respective areas determining the amount of variation. For the higher load the water is admitted below the piston, and the power due to the pressure on the full area of the cylinder obtained. For the lower load the water is admitted to both sides of the piston. The power exerted is then in proportion to the area of the ram.

3. By two concentric rams, working one within the other in the same cylinder, the external ram being secured by a pawl when not required.

Although the expenditure of water may be economized, wherever there is much variation of load, by the adoption of any of these expedients, it is not often they are resorted to, as the simplicity and ease of single-power machines are generally preferred to the economical advantages of the arrangements described. Nor is the loss from this cause so great as might be supposed when regarded as a per centage on the gross expenditure during any given period. No consumption takes place when no useful work is being done, and whatever loss there may be is, therefore, strictly limited to the intermittent operations of the machine.

#### Hydraulic Cranes.

Allusion has already been made to the hydraulic machinery at the Albert Docks. This affords the only instance in Liverpool of cranes worked by pressure from the public distributing mains. The difficulties experienced here and elsewhere in consequence of the variable draught from pipes used for general purposes of distribution led to the early abandonment of this mode of working in favour of an artificial head obtained from an accumulator—an apparatus devised by Sir Wm. Armstrong, and to be hereafter described. At the Albert Warehouses there are two cranes and two lifts; the former for raising goods from ships holds to the quay, and the latter for lifting goods from the quay to the several floors of the warehouses. The machinery for working the hydraulic cranes consists of two cylinders and pistons, one for lifting the load, and the other for slewing the jib. They are fixed horizontally in a chamber below the surface of the ground near the foot of the crane. The outer end of the piston of the cylinder for lifting the load carries moveable pulleys, around which the lifting chain passes from fixed pulleys attached to the inner extremity of the cylinder, to which the end of the chain is also secured. From the moveable pulleys the chain passes up the crane post and along the jib to the load to be raised. The slewing of the crane is accomplished by a rack connected with the piston, and gearing into an upright shaft acting upon the base of the crane. The motion of both lifting and swinging is controlled by levers attached to the inlet and outlet valves, and actuated by a handle above the ground level.

Considerable improvements have been effected in this class of machinery since the erection of the Albert Dock cranes. Rams have been substituted for the pistons, and the cost both of construction and maintenance has been greatly reduced. The application of water pressure to cranes has now become very general.

The cost of raising a load (which, in practice, averages 16 cwt.) from a ship's hold to the top of the Albert Warehouses, a height of 88½ feet, by the system described above, is, for water only, 2.1d. The cost of raising the load from a ship's hold to the quay (about 36 feet), including the slewing, is 0.6d., and from the quay to the top floor of the warehouse (52½ feet) 1.5d. The total annual cost of working this machinery, for water only, is £275.

#### Organ Blowing.

This is a purpose for which water power, with its steadiness and ease of control, is peculiarly well adapted, and for which it is in much request. There are, in the Liverpool district of supply, 14 organs blown by water pressure from the Corporation mains. Of these, four are in private houses, four are in chapels, and six in churches. The machine used for communicating the water power in these cases is, with only two exceptions, the ordinary Deacon water-meter, a patent of the late Water Engineer. This meter is the one that is chiefly used in Liverpool, especially in the larger sizes, to measure water distributed for trade purposes, and is very easily applied as a water motor. It has two cylinders, and the water is admitted through a slide-valve to each side of the pistons alternately. A rotary motion is obtained by slotted piston-rods working short crank-shafts. Where the Deacon engine is employed, the index motion attached to it registers accurately the volume of water passing through. With other forms of engines a meter has to be added to ensure a correct record of the consumption being obtained. The power is taken from the Deacon meter by connecting-rods communicating between the ends of the piston-rods and the levers of the organ bellows. The engine is made automatic by means of a rod connecting the bellows reservoir with the inlet valve. When the reservoir is full, the valve is closed, and as the contents are withdrawn the valve is opened.

The average annual cost of the water consumed in connection with the private organs is £1 4s. 9d. for each organ. The cost of blowing the church organs by water varies from £5 6s. 6d. to £29 13s. 3d. per organ per annum. The average cost is £15 18s. 11d. per organ per annum. As some of the organs included in the above summary are known to be much used for choir and private practice, the averages given do not afford a correct measure of what may be termed the ordinary useful consumption. I have, therefore, had special observations made in the following cases to ascertain the actual expenditure of water during one Sunday.

Case A is a church organ in the centre of the town, of 26 stops and five couplers. The cost of the water for one Sunday was 1s. 4d.

Case B is an organ of 25 stops and two couplers, in a Nonconformist chapel, where the available pressure is about the same as in case A. The cost of water for the Sunday was 2s.

Case C is an organ of 31 stops and five couplers, in a Roman Catholic chapel. The water consumed during one Sunday cost 6d.

Case D is an organ of 28 stops and seven couplers, in one of our parish churches, very favourably situated for pressure. The cost of the water for one Sunday's work was 2s. 9d.

Case E is a large organ in a well-known "High" church in the outskirts. The water consumption during one Sunday, at the same rate per 1000 gallons as in the preceding cases, cost 4s. 6d.

\* Passenger lift. Ascent in 12 to 30 sec.

† Maximum power of lift, 19½ cwt.

‡ Passenger hoist. Weight of room, one ton; weight of counterbalance, 23½ cwt.; time of ascent, 18 sec.; maximum number of passengers taken up at one lift, 15.

§ Recently fixed. Maximum power ascertained by experiment to be 12.2 cwt.; time coupled in ascent, 8 min. 31 sec. With 11 cwt.: time, 1 min. 7 sec.; pressure in air raised, 79 lbs.



*Miscellaneous.*

The miscellaneous purposes to which water power from the mains is applied in Liverpool are—to drive ventilating fans, for stone-crushing, and hair-dressing. The cost to a fashionable hair-dresser of driving his rotary hair-brushing apparatus is £1 19s. 9d. per annum. In this instance a Deacon meter is used, and a sum of £1 1s. per annum is charged as rent, and to cover the cost of inspection and ordinary repairs. The total cost per annum is therefore £3 0s. 9d.; and the average cost per working day is 2-3d.

The head required to work the Deacon meters, to overcome friction, is as follows:—1 in. meters (cylinders  $3\frac{1}{2}$  in. diameter and 5 in. stroke), 5 ft. 8 in.; 2 in. meters (cylinders  $5\frac{1}{2}$  in. diameter and 6 in. stroke), 5 ft.; 4 in. meters (cylinders 8 in. diameter and 11 in. stroke), 3 feet.

*Other Water-Pressure Machinery.*

The difficulties attending the working of cranes and similar machinery direct from the water-works mains, to which reference has already been made, and the expense of erecting elevated tanks from which to derive a steady head, led to the construction of the accumulator, an apparatus which has become the most distinctive feature of the system of water-pressure machinery with which the name of Sir Wm. Armstrong is associated, and which has contributed more than anything else to its rapid development and success.

The accumulator consists of a large vertical cast-iron cylinder, fitted with a loaded plunger working through a leather collar or gland. The weight case is suspended from a cross-head attached to the top of the plunger, and slides over the cylinder.

The cylinder is made of sufficient capacity to deliver the volume that would be required if all the machinery fed from it were in simultaneous action. The pressure in the cylinder is, of course, determined by the load upon the plunger. In practice it is generally about 700 lbs. per square inch, though a much higher pressure is frequently employed.

The accumulator is charged by a steam-engine, the power of which it accumulates at a constant pressure, thus giving a steady head, and enabling the continuous action of the steam-engine to be fully utilized in the intermittent action of the hydraulic machinery. When the supply from the engine exceeds the demands of the machinery connected with the accumulator, the plunger rises, and more water is stored in the cylinder. On the other hand, when the demand is in excess of the supply, the plunger descends until a balance is restored. The valve of the steam-pipe is controlled by levers from the plunger, so that the speed of the engine is regulated by the rise and fall in the cylinder.

From the accumulator the pressure may be transmitted to any required distance, diminished only by the friction against the sides of the channel conveying it. In the case of pipes the loss by friction is practically nil.

All the hydraulic machinery connected with the Liverpool Docks, with the exception of the Albert Dock machinery previously described, is worked upon this system. At the corn warehouses the accumulators are supplied by a horizontal high-pressure steam-engine of 370-horse power. There are two accumulators, with rams of 17 inches diameter, 17 feet of vertical range, and each carrying a load of 70 tons. Also an auxiliary accumulator with a ram of 20 inches diameter, a range of 23 feet, and a load of 100 tons. Power is transmitted from the accumulators to work the whole of the machinery in the warehouses, the lock machinery, and the bridges over the entrances, 12 sluices, 10 capstans, and 24 machines for opening and closing the lock gates. The supply of water is obtained from the Corporation mains, delivered into a tank erected over the engine. The exhaust water from the machines is conveyed by return pipes to a well in the engine-house and pumped up to the tank for further use.\*

Under this system, water is not the prime mover, but is merely employed as a means of accumulating and transmitting power. It does not, therefore, come within the limits to which this paper is chiefly confined. I may, however, enumerate here some of the principal further uses to which this class of water-pressure machinery is applied.

In docks—for moveable cranes and jiggers, docking ships, opening and closing dock gates, swing bridges, sluices, coal hoists, ship capstans. At sea—for working heavy guns, for steering gear. In railway yards—for wagon hoists, cranes, and capstans. For rivetting machines, flanging presses, and shop tools.

Any required pressure for driving shop tools, or special machines, may be obtained in a simple and economical manner by an intensifying accumulator, such as will be found described by Mr. Ralph H. Tweddell, in the Proceedings of the Institute of Mechanical Engineers for 1869.

The apparatus consists of a low-pressure cylinder with a piston, from which a ram works into a second or high-pressure cylinder. The pressure from the water-works main, or from an ordinary accumulator, being admitted into the first cylinder, the pressure in the second cylinder is increased in proportion to the difference between the area of the piston and that of the ram. In the instance referred to, the diameter of the piston was 19 inches, and of the ram  $3\frac{1}{2}$  inches, so that a pressure of 60 lbs. in the first cylinder produced a pressure of 1540 lbs. in the second. The latter is fed by a pump, no water being consumed in the first.

In Hull, a private Company obtained parliamentary powers in 1872 to pump water from the River Humber for distribution along the line of docks as a motive power, for working dock gates, cranes, and other purposes. The works have recently been completed, at an outlay of £17,000. Nearly a mile of 6-inch cast-iron main, 1 inch thick, with gutta-percha joints, has been laid, through which water is supplied at a pressure of 610 lbs. per square inch. Two pairs of high-pressure horizontal engines, of 60-horse power each, capable of pumping 130 gallons per minute at 700 lbs. per square inch, with steam at 100 lbs., have been erected. They pump into an accumulator of 18 inches diameter and 20 feet stroke, loaded with  $57\frac{1}{2}$  tons of copper slag and sand. The Company supply the high-pressure water to the Hull Docks at the rate of 4s. per 1000 gallons. The charge for working warehouse cranes is under  $\frac{1}{2}$ d. per ton for a lift of 40 feet.†

*New and Extended Applications of Water Power.*

There are many towns in England and on the Continent where water from the ordinary distributing mains is much more extensively used as a motive power than in Liverpool. As an instance I may mention Zurich in Switzerland, a town of about 20,000 inhabitants, where there are 113 water-engines, varying in size from  $\frac{1}{4}$  to 4 horse power at work for various trade purposes. The average pressure in the mains is about 50 lbs. per square inch, and the charge for the water consumed is at the rate of 5d. per indicated horse power per hour.‡

If we consider the advantages which water power affords, especially where a constant supply can be relied upon, it appears evident, from the examples that have been given and the facts that have been adduced, that there is room for a more extensive application of it.

Among the advantages which may be claimed are the following:—

1. Steadiness, ease, precision, and comparative noiselessness of action.
2. Absence of risk from accident.

3. Facility with which the movement of a machine may be controlled from any point of its travel.

4. Simplicity of working, rendering the employment of skilled labour unnecessary.

5. Saving in charges for insurance, as compared with machinery involving the use of fire or light.

6. Limitation of the expenditure of power to the time during which useful work is being performed, thus enabling machinery to be employed intermittently without loss of power.

7. Ease with which energy may be transmitted to considerable distances without appreciable loss.

8. The opportunity afforded of making special provision for extinguishing fires, by attaching fire hydrants to the pipes laid to convey the water pressure.

But my object is not to advocate a further use of water for purposes of the same character, and under the same conditions, as those which at present obtain. The facts and figures which I have placed before you will enable you to form an independent opinion as to the economy and suitability of this particular kind of power for various classes of work, and therefore to determine under what circumstances it may be desirable to employ it. There is, however, one branch of the subject to which I desire to invite your attention, and that is to the practicability of deriving useful work from power which is now wastefully expended; and of obtaining greater efficiency from existing machinery, by a more careful study of the principles involved in its construction, and in the application of hydraulic power.

The total average weight of water distributed each day in Liverpool, by measurement through meter, for trade purposes, is 14,126 tons. At the average pressure under which the distribution of this volume takes place, it represents 1,907,010 foot tons. Of this volume no inconsiderable proportion is delivered at or near to the level of the ground, and the head of water is therefore almost entirely expended in producing a high velocity of discharge. Though in the majority of cases this may be necessary, and the same results could not be attained, together with any further utilization of the head, without enlarging the diameter of the supply-pipes, there are numerous instances where a steady flow throughout the day, or during a part of the day, at a low velocity, might be substituted for an intermittent flow at high velocity. An illustration will perhaps make this more apparent. A consumer receives through a 2-inch meter an average supply of 20,000 gallons per day, at a pressure in the main of 60 lbs. per square inch. It is delivered into a tank at an elevation of 10 feet above the ground. Here is an available head of 125 feet over and above the head required to carry the water to its destination, and an available energy of 114,285 foot-tons per day. What I suggest is, that in all such cases the pressure may be utilized to fill an accumulator or high-level tank, from which it may be transmitted to work any machinery within its range.

An ingenious machine has been introduced into Leeds, chiefly in woollen warehouses where there are numerous hydraulic presses, by Mr. Benjamin Walker, for obtaining a pressure of as much as 2500 lbs. per square inch from the water-works pressure of 40 to 70 lbs. The town pressure is admitted into a cylinder having a ram of 14 inches diameter and 3 feet stroke, acting upon another ram of only  $1\frac{1}{2}$  inch diameter, the difference of area giving the required high pressure. The high pressure water is admitted to any of the hydraulic presses by simply turning a tap. When the contents of the cylinder have been expended, the ram is allowed to descend, and a fresh supply is obtained by simply working a slide-valve, an operation which can be performed by a boy. It will be obvious that there are many purposes to which an apparatus of this kind may be applied.

*Economy of Construction.*

An examination of the table on page 805 will show that the useful work derived from lifts and hoists is, in most of the examples, tabulated much under what is due to the pressure of water available; also, that the results obtained per foot-ton, multiplied by the pressure, vary to a remarkable extent.

The method of ascertaining the load in column 5, which has already been explained, must be kept in view; and regard must also be had to the fact that some of the machines were erected during a period when the supply to the town was intermittent, and when, in consequence of the increased demand upon the pipes during the hours of service, and the excessive waste that took place, the pressure of water was lower than it is at present. When allowance has been made for these circumstances, there still remains a difference between the power expended and the useful effect produced, considerably in excess of the loss usually assumed for friction. The co-efficient of effect for direct-acting machines of ordinary make should be about 90 per cent.; for machines multiplying six to one, a co-efficient of not less than 70 per cent. should be obtained; and for ten to one machines a co-efficient of not less than 50 per cent.

The defects in construction and erection are generally that platforms are made too heavy, and are not properly guided; imperfect packing; and badly-designed valves.

In the application of water pressure to organ blowing there is also considerable waste, arising from the imperfect and unskilful manner in which the power is taken from the engines. The principal causes of waste are—

1. The feeders not being made of sufficient capacity.
2. The length of stroke being too great.
3. In one instance, only one piston of the two-cylinder engine has been connected, and thus one-half of the power is lost.

I have briefly indicated the direction in which useful work may be derived from energy that is at present unprofitably expended, and in which economy may be practised in the application of water pressure. That the possibility of reducing or preventing any loss that takes place in existing machinery has not received more consideration, is probably due to the fact that such loss is intermittent, and its money value per lift or per day very small.

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade throughout this district continues in a very unsettled and depressed condition, and there is so much underrelying going on in the market that it is difficult to ascertain what prices really are being taken. In the gas coal contracts which are now being given out, the competition is very keen, and in one case I have heard so low a price was quoted, that a stipulation was made that neither the figure, the quantity, nor the name of the firm should be made public. Colliery proprietors, however, as a rule, although they will take extremely low prices, decline to tender beyond the customary twelve months. Good Arley coal for gas-making purposes can be readily bought at the pit mouth for less than 8s. per ton, and common gas coal for 6s. per ton. For other descriptions of fuel the demand is very small. The better classes of round coal for house-fire purposes move off very slowly; common coal is, if anything, a greater drag than ever, there being very little inquiry either for shipment or home consumption, and engine classes of fuel are naturally being thrown upon the market in large quantities by the serious strike in the cotton trade. Prices generally have a downward tendency, and in the Oldham district reductions of 1s. 3d. per ton on best coal, and 10d. on burgy, have been made.

\* For a full description of the hydraulic machinery in the Liverpool Corn Warehouses, vide Proceedings of the Institute of Mechanical Engineers, 1869.

† Vide Proceedings of the Institution of Civil Engineers, Vol. xlix., p. 2.

‡ Vide Proceedings of the Institution of Civil Engineers, Vol. xlix., p. 34.



A very large proportion of the pits are not now running more than half time, and where they are kept fully going heavy stocks are accumulating. Notices have been served upon the miners in the Oldham district of a reduction in wages amounting to nearly 17 per cent.

The iron trade is still without improvement, and although there is a great deal of pushing at very low prices, this has little or no result in bringing forward new business, consumers, as a rule, only buying to cover their present extremely limited requirements. In the finished iron trade there is a great deal of competition for orders, and a contract for 6 and 4 inch water-pipes, delivered into the Heywood district, was placed last week at £5 5s. per ton. Ordinary Middlesbrough plates delivered into the Manchester district are pushed at £7 2s. 6d.; Middlesbrough and Lancashire bars are quoted at about £6 2s. 6d., and North Staffordshire bars are quoted at about £6 5s. per ton.

#### THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The shipments of Durham coals have continued to improve over three weeks. Last week showed an increase of shipments from the Tyne Docks of 1000 chaldrons. The week before showed a similar increase over the week preceding it. The best gas coal trade is pretty steady, and the leading collieries work an average number of days in the fortnight. Second-class Durham coals are a little firmer, and recent quotations of prices are maintained. The demand for steam coals in the Northumberland district is tolerably good, and the best collieries are working well up to ten days per fortnight. A fortnight ago there was a sudden rise of Baltic and Mediterranean freights; but they are down again. Cronstadt rates have fallen from £11 to £9 per keel. The demand for tonnage to be employed in the coasting trade is very poor. Steamers hardly get 4s. 6d. per ton for London, and sailing ships about 5s. 8d. There is literally nothing doing for the east coast, and very little for the British Channel. The chemical market is extremely flat, and prices have fallen for all articles. Pig lead is £17 7s. 6d. to £17 10s. per ton; dry white lead, £24; red lead, £18 15s.; copper is sold in cakes and ingots at £68 to £69; best selected, £72 per ton. The iron market is extremely dull. Pig iron is selling, local make, No. 1, 48s. 6d.; No. 3, 43s. 6d. net cash; Scotch warrants, 51s. 6d. per ton.

#### TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

In consequence of the proposal which was made some months ago by the Police Commissioners of Johnstone to take over the local gas supply undertaking not having been amicably arranged, the Gas Company have appointed Mr. Henry Green, Preston, as their arbiter.

The loan of £25,000, for the purchase of the gas-works at Alloa, under the provisions of the Burghs Gas Supply (Scotland) Act, has now been negotiated, and the money received. The loan is for 22 years, and the rate of interest is 4½ per cent.

On the 13th inst. the Police Commissioners of Kirkintilloch sat as the Commissioners under the Burghs Gas Supply Act, when it was unanimously agreed that Mr. William Foulis, Manager to the Glasgow Corporation Gas Commissioners, should be appointed arbiter to act for the Commissioners in the reference between them and the Gas Company as to the valuation of the Company's works and plant. It was remitted to the Special Committee to make inquiries, and to consider and report as to obtaining a loan for the purchase of the undertaking.

The Directors of the Markinch Gas Company, Fifeshire, have resolved to recommend a dividend at the rate of 10 per cent. for the past year. A dividend of 6½ per cent. has been declared by the Falkland Company, which is the same as that made last year. The Directors of the Aberfeldy Gas Company have declared a dividend of 5 per cent.

In his report on the illuminating power of the gas supplied in Glasgow during the week ending the 11th of May, Dr. Wallace states the minimum ranged from 25.42 candles to 27.72 candles, the average from 26.11 candles to 28.55 candles, and the maximum from 27.44 candles to 29.46 candles. The western district showed the highest results in all cases.

Mr. Alexander Mackellar, who has for a number of years been Secretary and Treasurer to the Greenock Corporation Gas Committee, has just been appointed to various public offices held by Mr. Adam, Town Chamberlain, who has retired from active service. The finances of the Gas Trust will still be controlled by the new Chamberlain.

At the meeting of the Town Council of Ayr, on the 13th inst., authority was given for obtaining the opinion of Counsel in regard to the arrangement that had formerly been entered into between the Council and the local Gas Companies on the question of the discount allowed on the public lamp account. It is understood that the Police Commissioners are in sore straits for cash, and that, in consequence, they are determined to do their best to maintain a right to a discount amounting to 30 per cent.

It was reported to a meeting of the Glasgow Corporation Water Commissioners, held last Thursday, that there were already 39 district water-meters in position, covering a population of 60,401. At the starting of the meters the average consumption per head was 53.1 gallons per day, and that it had since been reduced to 32.6 gallons per head per day, thus showing a saving of 20.5 gallons per head per day, or a total of 1,238,220 gallons per day. Steps are being taken for the formation of additional districts on the south side of the River Clyde, to be placed under the meter system for detecting and reducing waste of water.

Pig iron sold in the Glasgow market during the past week at as low as 49s. 14d.; on Friday, however, there was an improvement, and the market closed with buyers at 49s. 3d. cash, and 49s. 5d. one month, though the price was still 4d. per ton under the closing price of the preceding Friday.

The coal market was rather disarranged during last week, through the idleness of the colliers; still very little inconvenience was experienced, as full supplies were forthcoming. The demand for most descriptions continues to be very limited, and as yet there is no appearance of better prices.

**PURCHASE OF THE STAFFORD GAS-WORKS.**—At the quarterly meeting of the Stafford Town Council on the 7th inst., a letter was read from the Local Government Board sanctioning the loan of £71,000 for the purchase of the gas-works.

**GAS-WELL AT KANSAS.**—The National Water-Works Company, Kansas City, Mo., whose works are located on the bank of Turkey Creek, in sinking an artesian well, have struck a copious gas stream at a depth of 247 feet. It is supposed that the gas reservoir or vein struck is the same as that on which the famous Wyandotte well is located. The gas will be used as fuel for the water-works, thus saving some 3000 dols. per year.

**LAMP-LIGHTING BY ELECTRICITY.**—At the meeting of the Metropolitan Board of Works, on Friday last, a recommendation by the General Purposes and Sanitary Committee, that Mr. St. George Lane Fox be informed that his application for permission to test his system of gas lighting by electricity, by applying it to the lamps on the Victoria Embankment, will not be entertained, on the ground that the experiments now being made in Pall Mall will probably be sufficient, was unanimously approved.

**SALE OF NEW RIVER SHARES, ETC.**—At the Auction Mart, on the 15th inst., Messrs. Fox and Bousfield offered to auction freehold estates in the New River Company, comprising—One-fourth of an Adventurer's share, one-fourth and one-fifth of a King's share, also 31 New shares, and 28 Annuities of £2 10s. each for 208 years. The Adventurer's shares realized at the rate of £93,200 per share, the King's share at the rate of £90,000 per share, the New shares an average of £332 5s. per share, and the Annuities £63 each.

**WASTE OF WATER AT DORCHESTER.**—An extraordinary waste of water in this town has been revealed by the survey of Messrs. Gotto and Beesley, of Westminster. It appears that from twelve o'clock at night to six in the morning there has passed out of the reservoir 76,680 gallons of water, representing a waste equal to nearly 40 gallons per head per day on a population of 7500. Messrs. Gotto and Beesley state the supply has been more lavish than that of Glasgow, with Loch Katrine flowing by gravity into the city. The estimate for new water-works, including the extension for Fordington, a part of the borough, is £17,877.

**NEW SEAM OF SCOTCH GAS COAL.**—The *Edinburgh Daily Review* says: "A new seam of gas coal in the Airdrie district has just been brought into the market by the Drumbowie Coal Company, Glasgow. It is a coal very rich in gas-producing elements, and with a first-class coke. The seam, which is well known in the district, is very erratic in its appearances, being met with now and again in various quarters in the Lower Ward of Lanarkshire, and disappearing again suddenly. From present appearances, the yield of the seam now being worked will be about 50 tons per day, and as indications have been got of its continuance over a wide area, it is likely to last for some time.

**QUALITY OF THE GAS SUPPLIED TO CAMBRIDGE.**—At the last meeting of the Cambridge Town Council, Mr. W. E. Pain, the gas tester, presented the following report:—"During the quarter ending on the 31st of March I made the usual test twice daily of the illuminating power of the gas supplied to this borough, with the following results:—The average of January was 14.90 candles, February 15.01, and March 14.90 candles. The whole of the observations (167 in number) were above the standard of 14 candles, with the exception of the evening of the 13th of March, which was equal to the standard. The sulphur and ammonia tests were also satisfactory, the Lethby apparatus giving 16.37 grains of sulphur per 100 cubic feet, being 3.63 grains below the minimum quantity allowed. The pressure has been maintained throughout the quarter in an efficient manner."

**QUALITY OF THE NEWCASTLE-ON-TYNE GAS.**—Mr. John Pattinson reports the following as the results of his examination, for the last month, of the quality of the gas supplied to the borough by the Newcastle-on-Tyne and Gateshead Gas Company:—

Date, 1878.	Illuminating Power in Sperm Candles.	Grains of Sulphur in 100 Cubic Feet of Gas.	Sulphuretted Hydrogen.
April 2 . . .	15.1	6.94	Nil.
" 5 . . .	15.3	7.27	"
" 9 . . .	14.6	6.64	"
" 12 . . .	14.2	5.40	"
" 16 . . .	15.5	4.52	"
" 18 . . .	14.3	5.08	"
" 23 . . .	15.7	5.61	"
" 26 . . .	14.8	5.98	"
" 30 . . .	13.8	6.19	"

A Sugg-Lethby standard Argand burner is used in testing. According to Act of Parliament, the gas should not be of less than 14 standard candles illuminating power, nor contain more than 17 grains of sulphur per 100 cubic feet of gas.

### Register of New Patents.

#### APPLICATIONS FOR LETTERS PATENT.

- 1687.—CLARK, A. M., Chancery Lane, London, "An improved pump." A communication. April 26, 1878.
- 1710.—COMOLLI, L. A., Valenza, Italy, "Improvements in means or apparatus for obtaining light." April 29, 1878.
- 1711.—EVANS, J., Wolverhampton, Stafford, "Improvements in steam-pumps and other motive-power engines and pumps, applicable also to valves for other purposes." April 29, 1878.
- 1714.—ENGEL, F. H. F., Hamburg, Germany, "Improvements in valves for pumps." A communication. April 29, 1878.
- 1724.—FOSBERRY, G. V., Beckenham, Kent, "Improvements in and relating to pumps." April 30, 1878.
- 1754.—MICHEL, C., and FRAGER, A., Paris, "Improvements in water-meters." May 1, 1878.
- 1757.—BRICKNELL, A. L., Southampton Buildings, London, "Improvements in means for joining the ends of lead pipes to each other, and for connecting fittings to such pipes." May 1, 1878.
- 1764.—CUTLER, S., Millwall, London, "Improvements in apparatus used in the manufacture of gas." May 2, 1878.
- 1770.—ABEL, C. D., Southampton Buildings, London, "Improvements in apparatus for igniting the charges of gas motor engines." A communication. May 2, 1878.
- 1844.—ASHWORTH, G. K., Halifax, Yorks, "Improvements in valves or taps used for steam, water, gas, or other liquid or fluid, such valve or tap being specially applicable for tallow-cups for lubricating purposes." May 8, 1878.
- 1859.—ARUNDEL, G., Sheffield, "Improvements in water-taps." May 9, 1878.
- 1860.—ABEL, C. D., Southampton Buildings, London, "Improvements in hydraulic mains, stand-pipes, and other conduits or receptacles for gas employed in the manufacture thereof." A communication. May 9, 1878.
- 1861.—SIMON, H., Manchester, "An improved blowing machine applicable for drawing or forcing fluids." A communication. May 9, 1878.
- 1796.—CAHILL, J., Dublin, "An improved method of preventing the escape of sewerage effluvia from rivers into which sewers are discharged, and for utilizing the flow of tides for the purpose of flushing such sewers." May 4, 1878.
- 1798.—HALLEWELL, R., Blackburn, Lancs, "Improvements in gas-engines, applicable in part to other uses." May 4, 1878.
- 1889.—MOLISON, A. R., Swansea, Glamorgan, "Lighting ordinary coal-gas jets by electricity." May 10, 1878.
- 1921.—BLACKWELL, W., Dalton-in-Furness, Lancs, "An automatic balance-pump." May 14, 1878.

#### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 4012.—OUTRIDGE, J. E., Egham, Surrey, "Improvements connected with steam and other engines and pumps." Oct. 29, 1877.
- 4028.—HUGHES, E. T., Chancery Lane, London, "Improvements in pumps." A communication. Oct. 30, 1877.



- 4118.—SPENCE, P., Manchester, "Improvements in the treatment of spent oxide of iron arising from the manufacture of gas, for the purpose of obtaining certain valuable products, and for rendering the said oxide again fit for use." Nov. 5, 1877.
- 4134.—MILLS, B. J. B., Southampton Buildings, London, "Improvements in the manufacture of gas for lighting and heating purposes." A communication. Nov. 6, 1877.
- 4154.—HOWARD, J., Erith, Kent, WILSON, A. F., and KINGDOM, H. W. A., Southwark, London, "Improvements in automatic apparatus for regulating the flow of liquids under pressure, and prevention of waste of water." Nov. 7, 1877.
- 4156.—HART, A. H., and POTTER, J. J., Birmingham, "Improvements in valves for liquid, steam, and gas pipes." Nov. 7, 1877.
- 4202.—SHOREY, F. W., Poplar, London, "Improvements in valves." Partly a communication. Nov. 9, 1877.
- 4217.—NAWROCKI, G. W. von, Berlin, "Improvements in meters for measuring liquids." A communication. Nov. 10, 1877.
- 4222.—BANGS, D. E., and BURNETT, W., Boston, U.S.A., "Improvements in carburetters." Nov. 12, 1877.
- 4249.—NEWTON, H. E., Chancery Lane, London, "Improvements in gas-regulators." A communication. Nov. 13, 1877.
- 4286.—KIDD, J. H., Wrexham, Denbigh, "Improvements in treating

excreta, house refuse, and sewage sludge, to obtain manure and other useful products therefrom, and in arrangements and apparatus to be employed therein." Nov. 16, 1877.

- 4332.—FORBES, J., and ABBOTT, J., Old Ford, London, "Improvements in apparatus used in the distillation of coal, for the production of coke, tar, and ammoniacal liquor, and the utilization of the resulting gases." Nov. 19, 1877.

- 4420.—KROMSCHROEDER, J. F. G., Walthamstow, Essex, "Improvements in means or apparatus for carburetting and purifying coal gas." Nov. 23, 1877.

- 4452.—WISE, W. L., Adelphi, London, "Improvements in lighting apparatus." A communication. Nov. 26, 1877.

- 4536.—WIRTH, F., Frankfort-on-the-Maine, Germany, "Improvements in purifying water." A communication. Dec. 1, 1877.

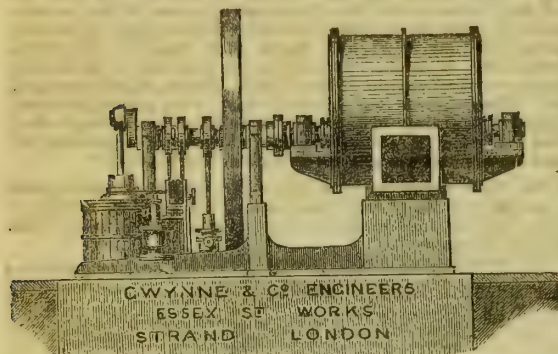
- 4591.—PLATT, J., St. Martin's Lane, London, "An improved automatic gas-stove for heating irons." Dec. 4, 1877.

- 4643.—DAVIES, W., Liverpool, "Improvements in regulating, controlling, or measuring the supply of liquids for water-closets and for other purposes, and in apparatus therefor." Dec. 7, 1877.

- 4789.—ABEL, C. D., Southampton Buildings, London, "Improvements in the treatment of hydrocarbons for their purification and conversion into other products." A communication. Dec. 15, 1877.

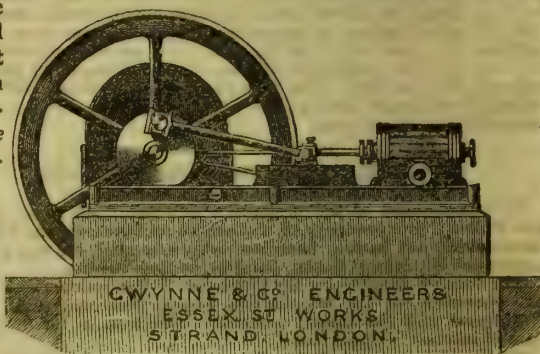
The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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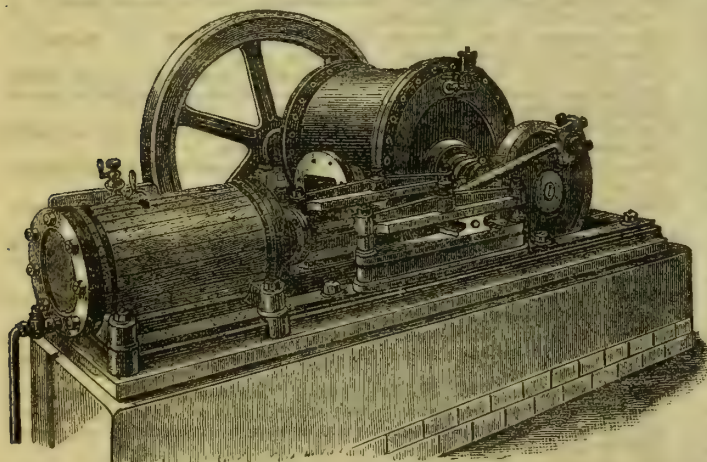
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**TAY WORKS, BONNINGTON, EDINBURGH.**



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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 28, 1878.

Circular to Gas Companies.

THOSE of our readers who perused the report and accounts of the Paris Gas Company will have observed one item in the expenditure which deserves notice—"To cost of experiments, &c., £1078." What the *et cetera* includes, we do not know; but the Paris Company every year expend money, which appears in their accounts under this head. It would, of course, be wrong to conclude that English Gas Companies make no experiments because no charge for them appears in their accounts. We know, as a matter of fact, that experimentation is always going on in many of the Metropolitan works. Every Manager has his own ideas on some matters, and endeavours to establish their correctness. He is also frequently pestered with the ideas of other people, who have inventions they wish to have tried. It is but right to say that Directors, as a rule, countenance these efforts at progress, and seldom refuse the money wanted. It would, however, be well if the experiments made were of a systematic and less desultory character. There are many points in the process of gas-making which require elucidation, and for this, close and continuous observation would be necessary. It is seldom within a Manager's power, so multifarious are his duties, and so incessant are the calls on his attention, to give the superintendence which is necessary when experiments are being carried on. Moreover, plant cannot be disarranged in the works for the substitution of experimental apparatus. Thus, investigations conducted, as we may say, during the ordinary course of business, become difficult to make. It would be highly desirable if we could have some works devoted entirely to experimentation. We rather think the Paris Company have, at one of their stations, a small apparatus for the purpose, and the importance of this to the Company can hardly be over-rated. The Paris Company possess also an immense advantage in having for their Vice-President M. H. Sainte-Claire Deville—a man almost unrivalled as a chemist and physicist. We can easily imagine that the experiments to which he lends his countenance and contributes his suggestions must be of great value. The £1078 were, no doubt, well spent last year, and with useful results.

There is one thing which would stand in the way of some Metropolitan Gas Companies expending money for experimental purposes. An Official Auditor might, perhaps, object that the cost for them was not ordinary expenditure, and might require

that the charges should be defrayed out of profits applicable to dividends. We do not say that this would happen; but it certainly would, if the Metropolitan Board of Works had their way. Apart, however, from all such considerations, we should be very glad to see the example of the Paris Gas Company followed, and money avowedly devoted to scientific investigation. It would soon bear fruit, which must ripen to the advantage of the Companies. It is within the power of any one Company to experimentalize for themselves; but the benefit would be infinitely greater if all combined in such an enterprise. One of the best results of a general amalgamation might be found in the opportunities it would afford for the furtherance of a scientific knowledge of gas-making. There is a very large field open to investigators, and a few thousands a year might be usefully spent in this direction.

We are rather disappointed that the subject of the heat of gas in ascension-pipes has not brought to our columns the observations which must have been made by many Managers. The subject is one of much practical importance, and we cannot help thinking with Mr. Newbigging, that when attempting to determine the heat of the gas three inches from the mouthpiece, Mr. Paterson really estimated the temperature of something more than gas. Clegg was a very careful experimenter, and we have little doubt that he could give good reasons for the truth of his statement; but it is a misfortune that he has not left on record the exact mode by which he made his determination. If a tube were passed through the lid of a retort, and pushed, say, a little beyond the mouthpiece, and the temperature of the gas taken immediately as it issued from the orifice of the tube into the air, we think Clegg would be found to be correct, and we have an idea that this was the way in which he made his experiment. The temperature of gas in an ascension-pipe may be a different matter. The experiments made at Manchester, at Mr. Newbigging's suggestion, are conclusive as to the heat of gas at the top of the ascension-pipe, and it seems that, at this point, the temperature closely agrees with that given by Clegg, as the heat of the gas issuing from the retort. It is known, however, that the heat rapidly diminishes as the distance from the retort is increased. To descend, however, from 653° Fahr. to a temperature at which gas might be safely admitted to the hydraulic, in the space of a few feet, would seem unlikely. We may just remark here that Messrs. Evans and Sugg require to coat the ascension-pipes with a non-conducting material, in order to get the gas to the hydraulic at a temperature of about 200° Fahr. We mention this matter as one point which might engage the attention of Gas Managers, if Companies and Corporations would encourage them in making investigations. There are very many others requiring elucidation, but we shall not here refer to them.

Mr. Wm. White, of Abersychan, is rather angry with us for not having bestowed more notice upon his automatic valve which is to dispose of the necessity for a dip, and also of the arrangement by which he proposes to dispense with the use of the hydraulic. Without agreeing with Mr. White in all he says of the evils resulting from the dip, we may at once grant that it would be advisable to get rid of it; and the automatic valve offers the means. The advantage of the arrangement seems to be that the retort is relieved of pressure, and, consequently, less carbon is deposited. The inference is that the gas is richer in illuminating power, which is, no doubt, the fact. Here is another matter which is worthy of investigation.

Perhaps we ought to apologize to our readers for once more calling their attention to a process for the manufacture of gas, devised by Mr. Stephan, of Worcester, and which has, we are told, been patented all over the world. We have now the specification before us, and a copy of it will be found in another column. Probably our readers will agree with us in thinking that nothing more grossly absurd is to be found even in the records of the Patent Office. The account we recently gave of it is, we find, substantially correct, but in the specification appear evidences of ignorance for which we did not give the author credit. He proposes, as our readers will see, to make oxy-hydrogen gas, and he professes to obtain his oxygen by acting on the oxide of iron formed when steam is decomposed in his metallic chamber by any suitable acid. What acid will separate pure oxygen from sesquioxide of iron we do not know, nor, we fancy, does Mr. Stephan. Having obtained his pure oxygen, he proceeds to mix it with hydrogen, and, apparently innocent of the fact that he has now an explosive mixture, he proposes to distribute it for illuminating, or at all events for combustible, purposes. We have already informed our readers of his proposal to obtain illuminating matter from sewage, but until we read his specification, we were unaware of an important fact, of which no mention has been made in the numerous puffs published respecting his system. Before Mr. Stephan could obtain patrons—and we learn he has many



and wealthy ones—he must have exhibited something which gave a good light, a light that could not be obtained by any treatment of sewage deposit. In his specification probably the truth comes out. In the place of sewage he may employ lumps of chalk saturated with petroleum, coal, coal dust, and even creosote. Of course, by the use of these agents some luminosity may be communicated even to a mixture of hydrogen and carbonic acid. It is remarkable that Mr. Stephan's friends announce that the great source of profit is in the residuals, which are said to be of so much value that a Corporation could afford to distribute the gas gratis, and pay "all the rates by the sale of residual products." Where these latter are to come from it is difficult to see. A burnt sewage deposit would leave nothing but some carbonaceous dust, which would be of no money value whatever. Lumps of chalk saturated with petroleum, would, when heated, become mere lumps of chalk again. Creosote, if distilled off, might give up a little tarry matter. Bones, when burnt, give off some foul oil, which is worthless, and leave a residue of bone ash, which is worth not quite so much as the original green bones. We are then, as we say, quite at a loss to see the source of the large profit which Mr. Stephan proposes to make. It would not be necessary to notice nonsense such as this, if it were not a fact that the process is attracting a good deal of attention in the Midland Counties, and we are told that a trial of it is to be made by the Corporation of Birmingham. We do not believe the story, for we feel certain that the able Engineers of that Corporation would decline to recommend their employers to give a trial of a scheme so preposterously absurd. The next thing in connection with it that we expect to hear of is a Limited Liability Company, with a large capital. It is rather late in the day now for gas schemes, but there are no limits to human credulity and cupidity. The times, however, are not propitious for schemers, and, perhaps, before money is again plentiful, it may be discovered that rich illuminating gas cannot be procured from limestone and sewage, and that a gas given away, with a profit of 150 per cent. on residuals, is all moonshine.

### Water and Sanitary Notes.

LAST Thursday evening Sir J. M. Hogg seized the first opportunity afforded, and withdrew the Water Works Purchase Bill promoted by the Metropolitan Board of Works. The Supply Bill will follow to limbo in due course. The excuse, naturally, was the late period of the session, and the impossibility of getting the measures through the two Houses during the present year. Our readers will, however, understand that the opinion of the House of Commons, and, we believe, the House of Lords, was distinctly antagonistic to the proposals of the Board. There was not this, and we venture to predict there will not be in any coming session, a disposition on the part of the Legislature to enlarge the powers of the Metropolitan Board so far as to give them the control of the water and the gas supply. It is freely recognized that the Board have already too much on their hands. They have obtained powers to effect various improvements, all highly desirable; but nothing is done, and, in some instances, we are told that nothing can be done for years. These things only bring obloquy on those who have been too ambitious, and have projected improvements far beyond their means to execute. If it be beyond their power to effect the comparative small improvements involved in the construction of new streets, and the new buildings under the Artisans Dwellings Act, it must be sheer impertinence which prompts them to assume the duty of supplying the Metropolis with water, which would land them in an outlay of from £26,000,000 to £30,000,000.

The letter of the Prince of Wales to the Society of Arts, respecting the water supply of the kingdom, has had its natural outcome in a conference in the Adelphi, which was appropriately presided over by Sir H. Cole, C.B., who probably prompted the letter signed "Albert Edward, P." The second day of the meeting was devoted to a consideration of the sources of the water supply of the Metropolis, and we are somewhat astonished to find that Dr. Frankland defends the supply of unfiltered water from the Thames for everything but dietetic purposes. He was wont to quarrel with the hardness of Thames water, as objectionable for laundry and manufacturing purposes; and, if we remember rightly, recommended the softening of Thames water before it was used. Caught by the scheme of Messrs. Bramwell and Easton, Dr. Frankland recommends a dual supply, but thinks that the two should come from the same source. If we understand him rightly, he would have the small quantity of water required for dietetic purposes very carefully filtered (say, through spongy iron), while water for other than dietetic purposes might be taken at London Bridge, and used after having been allowed to

settle for forty-eight hours. Dr. Frankland appeared to think that servants would not sufficiently discriminate between the hard supply taken into the house under the plan of the Metropolitan Board of Works, and the ordinary supply furnished by the Companies. We fancy the same difficulties would be found if his indoor and outdoor system were brought into operation. We quite agree with him, that the greater part of the water furnished to the inhabitants of the Metropolis is wasted. Ten gallons per head is quite sufficient for all purposes of domestic supply. It would be an immense advantage if we could have water supplied by meter; but, at the present time, that is impossible. We still lack a water-meter which can be used to measure domestic supply, and if Dr. Frankland's plan were set on foot, it seems that we should require two meters for every house. A conference of this kind naturally calls out many projectors. So, last week, we had Mr. Homersham, with his scheme of supplying the Metropolis from chalk wells, which may some day be considered when London has outgrown its present sources. Less likely to be seriously entertained is the plan of Mr. Hassard, C.E., who once more comes forward with his plan of bringing water to London from the Cumberland Lakes. We take no notice of the discussion of the action of lake water on leaden pipes and cisterns, since the water of Ullswater Lake contains lead in solution sufficient, it is said, to produce symptoms of poisoning. The physical difficulties in the way of bringing water from Cumberland to London would be easily surmounted, but the objections to such a scheme are patent to every one, the more so as close around are sources which may be deemed illimitable. Mr. Austin's, C.E., design of wells sunk in the lower greensand of London, at a depth 1800 or 2000 feet, looks well upon paper, but, unfortunately, recent experiments do not encourage the notion. Mr. Prestwich correctly pointed out that underground water is liable to the same sort of contamination as surface waters. Until recently, indeed, we have been in the habit of reading of "previous sewage contamination" in the water from deep chalk wells.

We need not follow the proceedings further than to mention the outcome, which was a resolution urging upon the Government the necessity of appointing a small permanent Commission to investigate and collect the facts connected with the Water Supply in the various districts throughout the United Kingdom.

Our readers know the strong objection we entertain to all Commissions of this kind. It would be easy, of course, for any one to select the Members at once, and to indicate the character of the reports to be written. Any such Commission, however, would seem, to a great extent, to be rendered unnecessary by a return which has been ordered by the House of Commons, on the motion of the Marquis of Stafford. This return is to give the following information, viz:—

The means by which drinkable water is supplied to every city and town in England and Wales, such means being provided by public or private arrangements. The return should state for each place—

1. The name and population;
2. The source from which water is supplied;
3. The arrangements made for the supply, by reservoirs, wells (artesian or otherwise), rivers (if filtered or not), or any other arrangements;
4. Amount of daily supply, and whether or not the supply is sufficient;
5. Whether the supply is constant or not, and the quantity used daily;
6. The geology of the district;
7. The rateable value of the district;
8. What has been the cost of works;
9. The annual charge per head of the population;
10. Under what Act of Parliament or other authority the works have been executed;
11. If any and what improvements are considered necessary.

The above return will apply only to urban districts, and the great outcry of the present day is for an effective supply to rural populations. This is a very difficult question, and we doubt whether a small permanent Commission would greatly help in the matter; but, after all, considering how public money is wasted on unworthy objects, we should not be dissatisfied to see the appointment of a Chemist, an Engineer, and a Geologist, who would write big Blue Books if they did nothing else.

The profitable utilization of sewage we still regard as an unsolved problem, notwithstanding Mr. R. W. Peregrine Birch, who comes forward with a pamphlet giving fifty instances of profitable sewage irrigation.\* Profitable the employment may be to farmers who obtain the sewage for nothing, or next to nothing; but the profits promised to ratepayers have never been forthcoming, and, we fear, never will be. We must content ourselves with commending this

\* "The Use of Sewage by Farmers; or, Fifty Instances of Profitable Sewage Irrigation." By R. W. Peregrine Birch. London: Spon and Co. 1878.



book to the perusal of all our readers who are interested in the utilization of sewage. With much that is put forth by the writer we cannot agree; but we are quite willing to admit that sewage, at proper times, and in quantities limited to the strict requirements of the land and the crops grown, may be very usefully employed. The enthusiast who dreams of disposing of the sewage of a town at all seasons of the year, will, we fear, be dreadfully disappointed; for, as a matter of fact, but little is required, and at irregular intervals, to fertilize the land and to stimulate the growth of crops. Speaking broadly, perhaps, sewage can only be profitably used on arable land for two or, at the most, three months out of the twelve. What is to be done with it during the remaining nine months? Clearly, it must find its way as quickly as possible to the nearest watercourse, purified or unpurified, as circumstances allow. The objects of a sewage farm are twofold. The primary, we think we may say, is to effect the purification of the sewage; the secondary, and scarcely less important, is to utilize such manurial constituents as the seasons permit. The two objects are not altogether incompatible; but it would seem clear that the ordinary arrangements of a sewage farm do not provide for both. Mr. Fowle, of Oxford, for instance, told the Conference at the Society of Arts, that the Corporation of his City were about to throw their sewage upon a farm close by the Thames, which would be as much polluted as before the drainage works were carried out. Other sewage farms in the kingdom are no better placed; and, perhaps, while agreeing with Mr. R. W. P. Birch, that certain farmers have profited by the application of sewage to land, we may take it as a fact that sewage farms have done but little for the purification of the liquid refuse of our towns.

The Bill of the Grand Junction Water Company has passed a Select Committee of the House of Commons, with the ugly insertion of auction clauses, at the instance of the Metropolitan Board of Works. The Company sought power to raise £300,000, with the usual borrowing powers, and it was, of course, intended that the new capital should be offered, as usual, to existing Shareholders. The Metropolitan Board officiously intervened, and the result is that the new capital must be offered to the public by auction. It is not to be expected that a large amount of capital not entitled to dividend will be raised under the operation of the auction clauses. The Company only pay 5 per cent., and are not likely to pay more for years to come, and since the investing public do not, as a rule, offer a higher price than will secure five per cent., we do not imagine that any considerable premiums will be realized. This infliction of auction clauses on Water Companies is somewhat novel. The Grand Junction Company are, of course, the first Metropolitan Company subjected to them; but all others will, in their turn, have to submit.

The Nottingham Water Company have also, as we have before mentioned, had auction clauses imposed upon them. This Company, in 1852, voluntarily proposed to offer their shares to the general public by auction; but they got tired of the system, and in 1874 succeeded in ridding themselves of the obligation. Now, however, as they come to Parliament after Mr. Raikes's Standing Order, they have the objectionable clauses forced upon them. The above, we believe, are the two first instances in which Water Companies have been compelled to offer their shares by public auction. In the one case, we do not think any considerable premiums will be realized, and it is difficult to see what benefit to the public can arise for many years to come. Long before the Grand Junction Company pay ten per cent., the Metropolitan Board of Works will have gone to the limbo of effete institutions. It was a precocious child; but, as is usually the case, the early promise of precocity never being fulfilled, the Metropolitan Board of Works will never acquire the Water Companies. They may pass into Municipal hands, but it will only be when the Board are a matter of history.

The Lambeth Water Company hold their half-yearly general meeting to-day, and we are happy to see that the profits admit of the payment of a six and a quarter per cent. dividend.

Contrary to our hopes, the Thirlmere scheme of the Manchester Corporation cannot be considered as safe in Parliament. The Bill was so much altered before the Select Committee of the House of Commons, that the Examiner of the House of Lords feels himself justified in reporting that, as it stands, the promoters of the Bill have not complied with Standing Orders. We do not, of course, know the feeling of Earl Redesdale on the matter, and all depends on the action he may take upon the question. If he approve of the measure, Standing Orders, though not strictly complied with, may be suspended; but without his approval the Bill must necessarily be relegated to another session, to the great discomfiture of all but the sentimental objectors.

## Communicated Article.

### WATER GAS.

In the JOURNAL of the 7th inst., we published a report made by Professor Würtz, on the chemical composition of the gas manufactured at the works of the Municipal Gaslight Company, New York. No doubt, many of our readers were surprised, on perusing that report, to find that the opinion entertained in past times as to the noxious character of carbonic oxide was entirely repudiated by the writer. We have thought, therefore, that a review of the history and progress of "water gas" manufacture might be interesting and useful, as bringing to light what the old school authorities really knew and said about the nature and effects of carbonic oxide. That it is present in large proportion in the mixed gases obtained by the decomposition of water with highly heated carbon in well-constructed furnaces is abundantly proved by the document just referred to, though its baneful influence seems therein to be completely ignored.

From the report of Professor Würtz, we find that on a certain day the gas under analysis contained 38.46 per cent. of carbonic oxide. Of course it did, the aim of the water gas maker being to produce this gas, instead of the incombustible article carbonic acid. The accomplishment of this object is that which inventor after inventor laboured unsuccessfully to achieve, until the time of the contrivance of the Kirkham furnace; in fact, Kirkham's method was considered a success because of this. No attempt, therefore, is made by the American users of his plan to disguise the presence of the once dreaded poison; knowing as they do that water gas cannot be profitably manufactured without admitting it as one of the constituents of the mixture.

Although it seems ridiculous to remove, by any means, however simple, so large a volume of combustible matter when once formed, yet it is well known that the feeling against it was so strong in France, some years ago, that the Alliance Company, holding the concession for lighting the "Hôtel des Invalides," being desirous to substitute the Kirkham gas for the coal gas they were then supplying, professed that they would purify it in such a manner that it should contain only 2 per cent. of this noxious element. Arrangements were made for carrying this plan into effect, but the gas, on being analyzed, was found to contain from 30 to 40 per cent. of carbonic oxide, instead of the specified quantity. After reading the following report, we can understand why Kirkham's process was so unceremoniously abandoned in France at that time, and why in these days a Frenchman should take the idea to America, instead of trying it again at home.

"Extracts from the report of M. Pelouze to the Municipal Council of Paris, in the sittings of June 24 and 28, 1854:—

"Kirkham's Gas.

"The use of this gas should also be severely forbidden, and to prove it your reporter need only cite the passage from the process-verbal of your third sitting, in which is reproduced the opinion emitted before the Commission by M. Dumas:—

"The oxide of carbon," said M. Dumas, "is a gas known from the commencement of the present century, and for many years no one thought of attributing poisonous properties to it—no man of science suspected it. When, therefore, 15 years since, it was proposed to me to employ water gas for lighting and heating, I must acknowledge I did not hesitate to advise, in my course of lectures, the making of experiments in this direction. M. Selligie appropriated to himself this idea, and made gas by the decomposition of water in the works at Batignolles, and rendered it luminiferous by means of oil of schist. Neither M. Selligie nor any one else then knew that this gas was poisonous. That was discovered later by M. Leblanc, in my laboratory, and we made some decisive experiments. It was proved that a mixture of 1 per cent. of oxide of carbon killed a strong dog in a minute and a half. It was a case of poisoning. With 1 per cent. of oxide of carbon all animals died at the end of a few minutes. These experiments terrified me. . . . Carbonic acid must not be confounded with oxide of carbon. . . . I formed an artificial atmosphere with 30 per cent. of carbonic acid. A large dog, on being placed in it, almost immediately fell on his side, but recovered himself on being restored to the pure air. 30 per cent. of carbonic acid did not kill, but, on the contrary, 1 per cent. of oxide of carbon is mortal. I am, therefore, satisfied that this oxide has the greatest inconveniences—above all, when applied to lighting."

"M. Selligie believed, with the most entire good faith, in the excellence and in the harmlessness of his process. He lighted a part of the town of Strasburg. One night the gas penetrated into a baker's shop, and several persons died. This was the first proof of the poisonous properties of this gas. Some time afterwards, M. Dupuis Delcourt was desirous of making a balloon ascent, and instead of taking hydrogen gas, he was obliged by accident to employ the gas of M. Selligie. The balloon was inflated; at the end of some seconds the aéronaut fell suffocated in his car. The balloon descended to the earth, and M. Dupuis Delcourt recovered his senses; but the persons who approached the balloon to give him assistance themselves fainted and fell. . . . It is impossible to admit that a gas producing such effects should be employed in any close apartment, in a shop, or in a theatre."

No process, however admirable and promising in other respects, could stand against such serious accusations as these, and, consequently, it was not long before Kirkham's system of gas manufacture was altogether abandoned in France. Its recent revival on the other side of the Atlantic leads us to notice what was done before Kirkham, and what has since been done by others; because there is no doubt that, if the water-gas idea becomes for a short time popular again, many transformations of the Kirkham furnace will make their appearance, and claim for themselves the charm of novelty.

We may note, in the first place, therefore, that before Kirkham's patent all the decomposers employed were fired on the outside, similar to gas-retorts; but since his time all are fired within—a distinction very broad and apparent, causing the difference in the amount of work done, for the fuel consumed, to be very great.

The idea of making hydrogen by the decomposition of steam was very prevalent in the early days of ballooning—the chemical method being a very cumbrous affair; but it was never brought into any



practical shape, the difficulty being the *fixing* of the oxygen. Could this have been readily accomplished, hydrogen from water would long since have been in the hands of the gas manufacturer for the production of light and heat, in preference to the mixed gases produced when water is decomposed by contact with incandescent carbon.

As far back as 1830 a patent was taken out by Michael Donovan for decomposing steam by passing it over red-hot coke or charcoal, and thereby evolving hydrogen and carbonic oxide, which, being inflammable, but non-luminous, had the latter defect corrected by the administration of some volatile hydrocarbon, which appears to have been a sort of naphthalizing at the burner—a system afterwards much improved by Mr. G. Lowe. In 1839 (May 8) Mr. Edward Oliver Manby took out a patent for "A New Method of Manufacturing Gas for general purposes of Illumination." The mode of action embodied in this patent was, no doubt, the type of all that followed up to Kirkham's time, save that he only claims the use of one decomposing vessel, and that of small diameter, through which steam is passed in contact with some sort of coal that is at the time being carbonized, whereas others claim to pass it through two or three, in order the more thoroughly to decompose the water vapour. But the distinctive feature of all—and hence the want of power to produce the required effect—is the application of the fire to the outside of the decomposers, "the same as for the distillation of gas from coals." The firing had to be most severe, and even then it was impossible to keep the carbon charge up to the temperature necessary for converting the steam into hydrogen and carbonic acid, and the latter into carbonic oxide.

This difficulty is unquestionably referred to in the first part of the specification of the patent taken out by Thadeus Sobienski C. Low, and George Spring Dwight, of the United States, and is mentioned by them in such a manner as to lead a reader to believe that they consider themselves to be the inventors of the remedy. They say: "Heretofore the manufacture of what is known as 'water gas,' for heating and illuminating purposes, has been practically unsuccessful, on account of the variable quality of the product, the excess of carbonic acid formed, the strain upon the apparatus involved by the heat required to obtain the best results, and the difficulty of producing the gases rapidly." We shall see, when we come to compare Kirkham and Lowe, with regard to dates and details, to whom is due the credit and value of the discovery, if any.

But to return to Manby. He, as we have before stated, claims having invented a "new method of manufacturing gas for illumination by passing steam into a retort or closed vessel containing anthracite, or stone coal, charcoal, coke, or bituminous coal, heated as hereinafter mentioned, and thereby obtaining a gas, or a combination of gases, applicable to the purpose of illumination." He used cylindrical retorts, about eight or ten inches in diameter, and placed them vertically in furnaces in twos or threes, according to circumstances. The furnaces, or combustion chambers, being supplied with fuel from the firing floor, were, therefore, always kept full. This, of course, subjected the retorts to a powerful and concentrated heat that soon destroyed them, although such heat was inadequate to the desired purpose, more especially as he only submitted the steam to one passage through each decomposer, instead of two or more.

Manby's patent was followed in the same year (June 22) by De Val Marino's, No. 8126, for "Improvements in the Manufacture of Gas," &c. The first part of the invention is described as "a method of decomposing tar, oils, and other fatty matters, and also water, whereby a more complete combination of the gases evolved is obtained, and, consequently, a more beneficial result than heretofore has been accomplished." The patentee then proceeds to describe a single group of his arrangement, by stating that *three* retorts are set vertically in a furnace, in such a manner as to become when fired intensely hot. All three are filled with coke or charcoal. *Two* of the group are used for effecting the decomposition of the water or steam, and the third for the vaporizing of the fat, oil, or tar. The steam having passed through the incandescent carbon of the first two retorts or decomposers, is presumed to be converted into a volume of hydrogen and carbonic oxide, equal to the yield due to the water vapour employed. This volume of mixed gas passes from the last of the decomposers to that into which the fatty matter, at the time being used, is slowly flowing, and takes down with it the hydrocarbon vapour, as it is generated in the third retort, through the heated mass of coke within, thereby forming carburetted hydrogen gas without the use of coal. Here we have the employment of three retorts in the circuit instead of one, and the application of matters rich in carbon, whereas Manby only seems to have aimed at increasing the volume of gas obtained from coal, without reference to its power. The following extract from his specification will make the Val Marino apparatus plain:—

"The drawing, fig. 1, represents in part section three vertical retorts suitably arranged for performing this invention, and the furnace is suitably constructed for conveniently heating and maintaining the same at a uniform temperature; *a*, *b*, and *c*, being the three retorts, one for decomposing the tar or oil, or other fatty matter employed, another for decomposing the water, and a third for continuing the process on the products of the water. It is not, however, material, which of the retorts are used for the separate duties, they being all similar. In the arrangement shown, *a*, is the retort in which the water is decomposed; *b*, the retort in which the tar or oil, or other fatty matter, is decomposed; and *c*, the retort into which the gases evolved in the retort *a* enter and are further decomposed, the object being fully to decompose the water before the products thereof come into the retort, *b*, to combine with the products of the other retort. *d* is a vessel containing tar or oil, or other fatty matter, and *e* is a vessel containing water. *f*, *f*, are two syphon-pipes which enter into upper parts of the retorts, *a* and *b*, and there are cocks on the vessels, *d* and *e*, to regulate the supply. The nature of the retorts, which are of cast iron, is clearly shown in the drawing, each retort having a projecting or

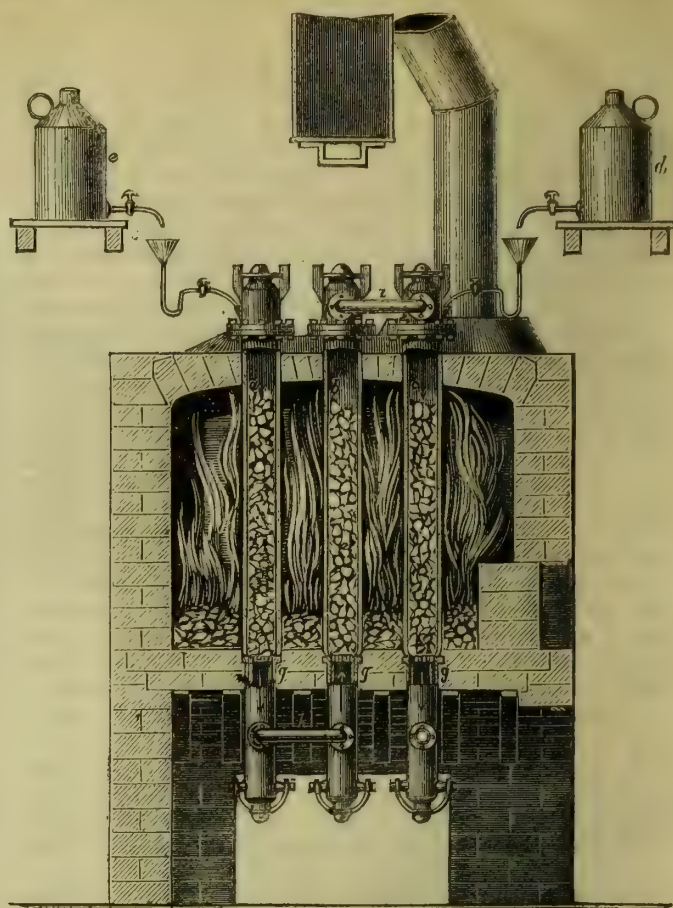


FIG. 1.

descending tube, *g*, connected at the lower end thereof, within which the gratings, which are similar to fire-bars, can be raised and lowered, and the coke or charcoal in the retorts rests on these gratings, which allow of the passage of any small ashes or dust of the coke. The arrows indicate the direction of the gases in and from the respective retorts, and the pipes, *h*, *i*, connect the retorts, *a* and *c*, and *b* and *c*, as is clearly shown in the drawing; and in using this apparatus the three retorts are filled from above with coke or charcoal, and then the ends of the retorts are to be closed, and all things arranged as shown in the drawing. I would here remark, that although I prefer that the retort, *c*, should contain charcoal or coke, this is not absolutely necessary, and it should be understood that I prefer the use of coke in consequence of its cheapness. The retorts are charged with fresh coke every 24 hours, and I have found that I am thereby enabled to retain the temperature required more readily. The retorts being at a good red white heat, the tar, or oil, or fatty matter, and also the water, is to be permitted to flow, observing that the water is allowed to drop in proportion to the requirement of the other matter employed, and as it is difficult to arrange apparatus to perform this operation in the nicety, and as the syphon-tubes might become more or less stopped in working, the simplest and best practical means I am acquainted with, for regulating the supply of water to the requirements of the matter employed, is to have a lighted gas-burner near the retort, and within sight of the workman. By this means he will, from time to time, be enabled to observe whether the result of his working is according to the desired object, and if he observes that the flame becomes more coloured than is proper, it will indicate that too little water is being supplied, and by this simple means the workman, having once set it right, the working will go on correctly unless some impediment is offered to the supply of the matter employed or the water. *j* is the gas-pipe leading to the gasometer. For it should be understood that carburetted hydrogen gas, thus manufactured, will not require purifying, which is an important advantage appertaining to this mode of working. It should be stated that the matter I generally employ, and according to the cost of the various matters above mentioned will, I believe, be most advantageous, is coal tar. And I would further observe that, although I prefer the arrangement of apparatus herein described for decomposing the matters and water employed, I do not confine myself thereto, provided the mode and process of working be retained as herein described."

We are rather surprised that such a man as Val Marino should have been led to believe that a gas made in the way he suggests would not require purifying. Coke contains sulphur, and when water is decomposed by being brought in contact with it whilst in a highly-heated state, some of the hydrogen formed combines with the sulphur present, and sulphuretted hydrogen is the result. From this there is no escape except by purification. Neither is it to be supposed that the decomposition was so perfect that no carbonic acid remained; if so, Val Marino did much more than has since been done even by Kirkham or Rowland.

(To be continued.)

QUALITY OF THE GAS SUPPLIED TO HULL.—Mr. Baynes reports that the gas sent into the district of Sculcoates and Myton, during April, by the British Gas Company, gave the following results, free ammonia and sulphuretted hydrogen being at no time present to the ordinary tests:—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16.21	15.10	15.78
Grains of sulphur per 100 cubic feet	28.60	26.50	27.80
Grains of ammonia per 100 cubic feet	—	—	—
Mean barometer, 29.96; temperature, 57°.			



## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

## THE TEMPERATURE OF GAS IN ASCENSION-PIPES.

SIR,—Although indisposed to agree with my friend, Mr. Paterson, and with Mr. Newbigging, in their estimate of the practical importance of the question raised by the former, its solution is, at any rate, a matter of interest to all gas manufacturers. Taking this view of it, I have caused a series of observations to be made, placing thermometers in an ascension-pipe at distances of 1 foot 6 inches and 4 feet 6 inches above the mouthpiece. The retort, one of a setting of seven placed immediately over the furnace, and therefore the hottest, is a 21 inch by 15 inch oval, and was charged in the ordinary way with about 2½ cwt. at each end at six o'clock and again at twelve o'clock. The following are the results, the observations having been taken every half hour:—

Time.	Above Mouthpiece, 1 Ft. 6 In.	Above Mouthpiece, 4 Ft. 6 In.	Time.	Above Mouthpiece, 1 Ft. 6 In.	Above Mouthpiece, 4 Ft. 6 In.
6.00 a.m.	248 deg. F.	154 deg. F.	12.30 p.m.	294 deg. F.	187 deg. F.
6.30 "	260 "	168 "	1.00 "	282 "	165 "
7.00 "	270 "	164 "	1.30 "	288 "	152 "
7.30 "	274 "	150 "	2.00 "	296 "	140 "
8.00 "	280 "	140 "	2.30 "	294 "	135 "
8.30 "	290 "	135 "	3.00 "	290 "	134 "
9.00 "	284 "	128 "	3.30 "	286 "	128 "
9.30 "	282 "	125 "	4.00 "	282 "	124 "
10.00 "	280 "	120 "	4.30 "	280 "	120 "
10.30 "	278 "	115 "	5.00 "	280 "	120 "
11.00 "	280 "	115 "	5.30 "	280 "	120 "
11.30 "	280 "	115 "	6.00 "	280 "	120 "
12.00 "	280 "	115 "			

I venture to think Mr. Paterson has arrived at an erroneous conclusion, from the appearance of a higher temperature at the earlier part of the charge. This is surely due, not, as he supposes, to a higher temperature of evolution, but to the larger volume requiring to be cooled, the ascension-pipe being less efficient for this purpose at the beginning than at the end of the charge, when the volume given off is very much less. This is apparent from the above results, which show that the difference of temperature was greatest at the point farthest from the mouthpiece.

Birmingham, May 24, 1878.

CHARLES HUNT.

SIR,—In my last week's letter I gave a statement of the temperature of the gas, as indicated at the bridge-pipe over the retort-bench, before passing into the hydraulic main. Agreeably to promise, I now send you the notes of experiments made with a view to the further elucidation of the subject under consideration.

## Experiment 1.

This experiment was conducted entirely under the usual conditions of working.

Clay retort, 20 feet through, one in a setting of seven.

Heat, bright cherry red.

Hole drilled in both ascension-pipes 3 feet above the mouthpiece.

Retort charged with 4 cwt. of cannel.

Temperature indicated on insertion of thermometer through the hole on one side of bench, 193° Fahr.

Temperature indicated on insertion of thermometer through the hole on the other side, 510° Fahr.

The temperatures indicated were clearly not those of the gas. In attaining the higher temperature especially, the mercury rose by starts at the rate of 3° to 5° at once, evidently caused by hot particles of solid carbon, or other solid or semi-fluid substances, coming suddenly in contact with the bulb of the thermometer.

The remarkable difference in the temperature of the two sides I account for in this way:—On the side in which 193° was indicated, the dip-pipe was probably sealed to a greater depth in the hydraulic main, and, consequently, the flow of gas was neither so abundant nor so rapid, on that side as on the other. This was evidenced by the thermometer, on withdrawal, being found less thickly coated with tar than in the other case. The gas was in a more quiescent state, and, therefore, there was not the same rush of hot solid particles against the bulb to raise the temperature abnormally.

## Experiment 2.

The conditions were the same as in the previous instance; but, instead of inserting the thermometer directly through the hole in the ascension-pipe, a piece of india-rubber tube, 12 inches long, ¼-inch bore, was pressed against the orifice, and the gas allowed to flow in a stream through the tube. The object of employing the tube was to obviate, if possible, the contact of the semi-solid or semi-fluid substances previously referred to.

The result was:—Temperature indicated on one side, 250°; ditto on the other side, 324°.

The rise of the mercury was still somewhat irregular, and the instrument, as far as inserted, was again thickly coated with tar.

## Experiment 3.

One end of the through retort was now bricked up, being made perfectly gas-tight, the gas passing away by one only of the ascension-pipes; in point of fact, the retort was made single instead of through.

In a short double-flanged piece of the ascension-pipe, within 8 inches of the top of the mouthpiece, were inserted six layers of iron wire netting, cut into discs, accurately fitting the bore of the pipe. Three of these discs had meshes one-eighth, and the other three three-sixteenths of an inch gauge, and the discs were kept three-fourths of an inch apart by sheet-iron rings, inserted edgewise into the pipe.

The charge, 2 cwt. of cannel, thrown into the retort, happened to be taken from a heap that had been exposed to the rain, and there was considerable moisture present.

The hole through which the thermometer was inserted, as in the previous experiments, was 3 feet above the mouthpiece.

The following were the temperatures indicated:—

Time. Minutes.	Temp. Fahr. Degrees.	Time. Minutes.	Temp. Fahr. Degrees.
10 . . . . .	200	55 . . . . .	177
15 . . . . .	198	60 . . . . .	174
20 . . . . .	195	65 . . . . .	172
25 . . . . .	192	90 . . . . .	160
30 . . . . .	190	105 . . . . .	158
35 . . . . .	188	120 . . . . .	150
40 . . . . .	184	130 . . . . .	150
45 . . . . .	182	140 . . . . .	148
50 . . . . .	179	150 . . . . .	142

Through all the higher temperatures, down to 172°, steam was condensed into drops upon a piece of paper held in the stream of gas issuing from the hole. Tar, though not entirely absent, was nearly so, the instrument on each withdrawal being but slightly coated. The temperature, with but few exceptions, rose with great regularity from that of the atmosphere of the retort-house (74°) to the rates observed, showing that the semi-solid particles, which were evidently the cause of the high temperatures previously indicated, had been nearly all arrested by the wire netting.

The higher temperatures, I am of opinion, were due to the presence of steam in the gas, in varying proportions, and this latter would be caused by the moisture in the coal.

## Experiment 4.

The retort was again charged, this time with 2 cwt. of cannel in a drier state. All the other conditions were as in the previous trial.

The following were the results obtained:—

Time. Minutes.	Temp. Fahr. Degrees.	Time. Hours.	Temp. Fahr. Degrees.
2 . . . . .	158	1½ . . . . .	120
7 . . . . .	174	2 . . . . .	123
12 . . . . .	177	2½ . . . . .	122
17 . . . . .	172	2¾ . . . . .	119
22 . . . . .	171	3 . . . . .	118
27 . . . . .	169	3½ . . . . .	116
32 . . . . .	168	3¾ . . . . .	113
75 . . . . .	141	3½ . . . . .	110
90 . . . . .	134		

During the first half hour of the charge, the presence of steam, mixed with the issuing gas, was indicated as before, but less abundantly, though still, doubtless, affecting the results obtained. When the temperature of the gas within three feet of the mouthpiece was at 174°, it stood at 132° in the bridge-pipe, 14 feet higher up.

It may be suggested that the effect of passing the gas through the wire netting would be to lower the temperature of the gas, just as the wire gauze on a Davy lamp reduces the temperature of the flame impinging against it. The conditions in the two cases, however, are entirely different. The meshes were sufficiently large to admit of an easy passage for the gas, and the metal would be immediately covered with a thick coating of tar, virtually producing insulation. In addition to that, the temperature within 6 inches of the front of the bench was 208°, and the metal of the ascension-pipe, as well as the inserted wire netting, would, as a rule, be above the temperature of the gas.

I have not time at present to point the lesson which these various experiments convey; but there is little need to do so, as they speak for themselves, and they will be found, in the final results, to agree in a remarkable manner with the deductions of earlier investigators.

Cursorily it may be noted that there was but little accumulation of tar in the mouthpiece when the lid was removed after the trials with the wire gauze, the small quantity that was found being entirely converted into pitch; doubtless with an increase both in the quantity and quality of the gas produced.

5, Norfolk Street, Manchester, May 24, 1878.

THOS. NEWBIGGING.

SIR,—To the minds of those who are investigating the matter I ventured to introduce in my former letter, Mr. Newbigging's reply in the last JOURNAL will be a disappointment.

He assumes to have disproved the facts I mentioned, on the supposition that the high temperature I found in the ascension-pipe, near to the mouthpiece, was due to the heat transmitted by conduction to the pipe; and to have proved the truth of the received opinions, and consequently to have proved my experiments to be fallacious, by taking the temperature of the gas in three ascension-pipes, 14 feet from the mouthpiece.

Probably, in the midst of many duties, Mr. Newbigging had not time to carefully read my letter, for had he done so, he must have seen the folly of endeavouring to account for the high temperature at the mouthpiece in the way he has done. If, as is asserted, it is due to conduction, the question occurs, what raised the mercury in the ascension-pipe from 80°, at which it stood before the retort was charged with coal, to 640° immediately after, when gas was being evolved? or, what caused the temperature in the ascension-pipe, in the experiment recorded in the first column of the table accompanying my letter, to vary from 363° in the first minute after the retort was charged, to 544° in the eleventh minute, and then to fall to 172° at the end of an hour; or, to put it more familiarly, at the end of the charge? Would it not be impossible, with these facts in view, to come to the conclusion that the heat of the gas did not cause the mercury first to rise and then to fall again, as the temperature of the gas itself increased or diminished?

The experiments which Mr. Newbigging made at Manchester, although they are useful in their way, really do not come very near to the question, for it cannot be allowed that a thermometer 14 feet away from the source of heat can give any indication of the temperature at that point, and I am profoundly surprised that Mr. Newbigging should have considered them sufficiently condemnatory of my facts to justify him in the conclusions he has arrived at. His experiments neither prove the truth of received opinions nor the fallacy of my deductions; they are simply a record of the temperatures in three ascension-pipes, taken, under certain conditions, 14 feet away from the mouthpiece. The thought constantly recurs to my mind, as I write this, Why did Mr. Newbigging not put a thermometer in the ascension-pipe nearer to the mouthpiece—say, 3 feet above it—instead of the extraordinary distance of 14 feet away?

Gas-Works, Cheltenham, May 24, 1878.

R. O. PATERSON.



## GAS-TESTING AT NEWCASTLE-ON-TYNE.

SIR,—Referring to the report of Mr. John Pattinson, inserted in the last number of the JOURNAL, I cannot but admire the good sense of the Newcastle Town Council and the Gas Company in agreeing to use the old-fashioned Liebig condenser, as a means of testing for sulphur, which gives results so satisfactory to both parties.

It would have saved a vast amount of trouble and expense had the London Referees adopted the same means of testing. The Gas Companies would then have had very little difficulty in dealing with the moderate quantity of lime required, and the official reports, on the principle that "ignorance is bliss," would have fully satisfied the public.

These reports are in their proper place in the local newspapers; but I think that, if it is necessary to publish a monthly report of the Newcastle testings in your widely-read JOURNAL, and thus give it the seal of the authority the JOURNAL deservedly enjoys, the system of testing should be stated, just as the burner is described.

If your readers were informed that these sulphur tests were made with an apparatus that was discarded, as unreliable, a quarter of a century ago, they would take the reports of 6, 5, and 4 grains at what they are worth, as did an Engineer who went to Newcastle in consequence of these low records, in order to become acquainted with the system of purification, which turned out to be no better than, if so good as, his own, although his average of sulphur is nearer 15 grains than 5.

Of course, those who know the circumstances place no faith in the reports; but probably the greater number of your readers are under the impression that the Referees standard test is used, the result being that unfair comparisons are made with those Companies whose gas is properly tested. Let us have all the reliable information that is to be obtained on this question; and if it be found in any place that the sulphur can really be kept down to an extremely low point without nuisance or difficulty, the whim of the public for a low proportion of sulphur will be cheerfully gratified by the adoption of the means indicated.

GEORGE LIVESKY.

South Metropolitan Gaslight and Coke Company,  
589, Old Kent Road, S.E., May 25, 1878.

[We have never thought it necessary to inform our readers that Wright's Sulphur Test is used by Mr. Pattinson at Newcastle. That gentleman asserts that the results obtained by the use of this apparatus are very nearly the same as with the Referees test. We believe this, however, to be contrary to the experience of all others who have used the two, and that the quantitative determinations made by the former are generally deemed quite untrustworthy.—Ed. J. G. L.]

## THE SALES OF GAS ACT, 1859 (22 &amp; 23 VICT., CAP. 64).

SIR,—Some questions were asked in your last JOURNAL respecting this Act, to which I should like, with your permission, to give a short reply now, and one more at length on a future occasion.

The Act, although a public Act in every sense of the word, was not promoted by the Government of the day, but by some of the Meter-makers, adversely, rather than otherwise, to the Companies, but who nevertheless took no action in it one way or the other. I mention this as, it being one of the worst drawn, most unintelligible Acts that was ever passed, it is desirable that the Companies should not be charged with having made it so.

I will number the questions, and answer them separately:—

1. "Is it lawful for a Gas Company or Corporation, who have not adopted the Sales of Gas Act, to sell gas by meters which have not been stamped according to the Sales of Gas Act?"

Companies have nothing to do with the adoption of the Act. It is for the Local or District Authorities to adopt it, and for the Companies to regulate their proceedings accordingly.

If a city or borough adopts the Act, it applies only to their respective districts, and not beyond; but if a county adopts the Act, it applies to the whole of the county including those districts. It is quite possible, therefore, for part of a Company's district to be under the Act, and part not, and where it is not, the Company may proceed with their operations as though the Act had never passed.

A Company might apply the Act to the whole of its district if it thought fit to do so, but that would not give the Act any legal status; no one would be able to proceed against them for failure.

2. "Are all towns and boroughs in the United Kingdom compelled to adopt the Sales of Gas Act, or is it optional for them to do so?"

In England and Scotland, the Act of 1859 made it obligatory upon counties and county towns, where gas is used, to put the Act in operation, but left it optional only for cities and boroughs, other than county towns, to do so or not, as they saw fit.

In Ireland, the Act of 1859 made it compulsory upon all towns and boroughs to put the Act in operation, and they failing, upon the counties to do so for them, but so far only as the towns and boroughs could have done themselves.

The Sales of Gas Act Amendment Act, 1860 (23 & 24 Vict., cap. 146) provides (clause 1) that the Act shall not come into operation in any county of England, Scotland, or Ireland, until the authorities of such county shall have decided to bring such county under the operation of the Act.

The Act, therefore, so far as England and Scotland are concerned, can only be obligatory upon county towns, and there may be some doubt whether the sweeping provision of the Act of 1860 does not even override this, and leave the Act entirely optional.

3. "Can any Gas Company or Corporation, who have not adopted the Sales of Gas Act, clean and repair meters, and use them again, without having them tested and re-stamped according to the Sales of Gas Act?"

If the Local Authorities, county and town, have not adopted the Act, the Companies are not subject to it in any way, and may make, repair, sell, and use meters the same as though the Act had never passed.

4. "If any of my brother Managers can name any Acts of Parliament bearing on the above questions, they will greatly oblige."

The only two Acts bearing upon the question are the two Acts quoted in this letter. Reeson's "General Gas and Water Acts," published by

Waterlow and Sons, contains these and all the other general Acts relating to gas and water, and every Manager should have a copy of it in his office. It is a small handy pocket volume, and the price, I believe, is 5s.

W. LIVESKY.  
Gas and Water Companies Association, 6, Victoria Street,  
Westminster, May 25, 1878.

## WASTE IN GAS-WORKS.

SIR,—My attention having been drawn to a paper by Mr. Hepworth, "On Waste in Gas-Works," a subject which should have our careful attention, I desire to record, for the use of others, what I am doing in one branch of that subject, that of the raising of steam. I have, for the past eight months, and am now raising steam in a boiler, 22 feet long and 7 feet in diameter, from the spent heat of one stack of retorts. At the present time there are only six fires out of the ten in this stack, which keep up the steam at 60 pounds pressure for one steam-jet exhauster, two small engines, and two "Special" pumps. Last year, this time, we used 31 cwt. of coke every 24 hours, besides the cost of extra fireman.

I fear there are few works that use so small a quantity of coke for fuel as 25 per cent., though I hope to bring mine down to that. Last year I was a little over 28 per cent.

Gas-Works, Burnley, May 25, 1878.

SAMUEL PETTY LEATHER.

## AIR AS FUEL.

SIR,—We have recently patented a complete combustion furnace, which entirely overcomes the difficulty experienced by "J. W." in the use of air. The principle consists in the production of a more or less impure carbonic oxide gas in the furnace proper, which is thoroughly consumed, in the chamber over the furnace, by fresh oxygen supplied through air channels and apertures in the sides. The furnace, which is of unusual depth, is wedge-shaped, being wider at bottom than at top, and the air is admitted above the line of fuel. There are two doors, the upper being for the purpose of supplying fuel, and the lower for cleaning. This furnace has now had a thorough and extended trial at the Aldershot Gas-works, with the most satisfactory results, as to fuel used, tear and wear, and labour in working. The whole of the furnaces at the above works are now adapted to work on this plan.

The furnace may be seen in operation at Aldershot, and we shall be glad to furnish any further information which may be desired.

Aldershot, May 23, 1878.

WILSON AND DOUGLAS.

## ANTI-DIP PIPES.

SIR,—Acting upon the advice of several of my friends and others professionally connected with the gas industry in various parts of the kingdom, I respectfully beg to draw your attention to the editorial observations in your last issue, in reference to an address by Mr. James M'Gilchrist (Dumbarton), delivered before the West of Scotland Association of Gas Managers. In giving your approval of the theory advanced, you appear to accord the credit—if any credit be due in connection with so important a matter—to the gentleman named; and I feel sure that you must have penned those lines in a moment of forgetfulness, inasmuch as the introduction of the theory to the gas world is not of so recent a date as the 25th of last month. During the past four years I have been labouring with a view to provide means for avoiding the evils produced by passing hot gas through the liquid in the hydraulic main, or, in other words, to prevent the rich illuminants of the gas being washed out of it by the action of the dip; and in a pamphlet which I wrote last year, I gave distinct reasons why the use of the dip should be at once dispensed with—identical, strange to say, with those mentioned by Mr. M'Gilchrist in his address. I may also remark that I have letters in my possession from several of the most eminent Gas Engineers in this country and abroad, extending to me their encouragement and compliments for having drawn the attention of the gas world to so important a matter, and for providing a remedy as well. The latter is now on the eve of being tried in London; it has been used with the desired success in several provincial gas-works during the past three years, and, with the latest improvements which I have effected, the success is now certain. Indeed, the question, through my own unaided exertions, has been brought to the front, and I am sure it will be very much to the benefit of gas companies and gas consumers in the end. A well-known Engineer and Author on gas matters, writes me as follows in reference to my system:—

"Your theory is entirely new, and more than that is correct, and calculated to upset all the old-fashioned ideas of the hydraulic main. You have undoubtedly a good affair in hand, and the importance of your system is now becoming recognized; in short, your valve is one of the most important of modern appliances in the manufacture of gas. You must be prepared for some rebuffs, as people will be slow to admit that they have been blundering for sixty years—making good gas, and then washing out its richest constituents in the hydraulic."

My only reason for not pursuing this part of the subject further, is my fear of wearying you, and I rely upon your usual courtesy and straightforwardness to correct what evidently was an unintentional pass-over of my just claim to be recognized as having been the first to draw the attention of Gas Engineers to the question—long before Mr. M'Gilchrist; and, what is more, I have provided a remedy which I cannot help thinking deserves to be noticed by the leading organ of the gas industry. By this post I beg to hand you a copy of my pamphlet descriptive of my invention and its application.

W. WHITE.

Abersychan Gas Company, near Pontypool, May 24, 1878.

[Our correspondent's automatic valve is described, and illustrated with three engravings, in our "Treatise," Vol I., page 257. In the paragraph in the JOURNAL to which he objects, it is not claimed for Mr. M'Gilchrist, and we are certain that that gentleman did not claim for himself, any credit as the inventor of the arrangement.—Ed. J. G. L.]

INSTITUTION OF CIVIL ENGINEERS.—Mr. Bateman, as President, will give a *conversazione*, for gentlemen only, in the India Museum, South Kensington, on Monday, the 3rd of June, being the fiftieth Anniversary of the granting of the Royal Charter of Incorporation.



## Parliamentary Intelligence.

## HOUSE OF LORDS.

MONDAY, MAY 20.

The Examiners reported that the further Standing Orders applicable to the East Bedford Borough Bill have been complied with; and that no further Standing Orders are applicable to the Maryport Improvement Bill. Cockermouth and Workington Water Bill,—reported with amendments. Lea Bridge District Gas Bill, Lewes Gas Bill, Nottingham Water Bill, Scarborough Water Bill,—read the third time, and passed. Dalton-in-Furness Local Board Bill,—read the third time, with the amendments, and passed.

TUESDAY, MAY 21.

The Chairman of Committees informed the House that the opposition to the Bangor Local Board Bill was withdrawn. Tredegar Water and Gas Bill,—reported without amendment. Scarborough Corporation Water Bill,—reported with amendments. Weston-super-Mare Improvement Commissioners Bill,—brought from the Commons, read the first time, and referred to the Examiners. Hamilton Burgh Bill, Hemel Hempstead District Gas Bill, Stoke-upon-Trent Corporation Gas Bill,—read a second time, and committed. South Staffordshire Water Bill,—read the third time, and passed. West Houghton Local Board Bill,—read the third time, with the amendment, and passed. South Hants Water Bill,—read the third time, with the amendments, and passed.

Southport Water Bill, Limerick Corporation Gas Bill,—referred to a Select Committee, consisting of Earl Morley (Chairman), Earl Manvers, Lord Saltersford, Lord Gwydir, and Lord Hammond; to meet on Friday, May 24.

THURSDAY, MAY 23.

The Examiners reported that no further Standing Orders are applicable to the Newbury Borough Extension Bill; and that the further Standing Orders applicable to the Manchester Corporation Water Bill have not been complied with.

Hemel Hempstead District Gas Bill,—reported with amendments. Maryport Improvement Bill,—read a second time, and committed. Cockermouth and Workington Water Bill,—read the third time, with the amendments, and passed. Radcliffe and Pilkington Gas Bill,—brought from the Commons, read the first time, and referred to the Examiners.

Manchester Corporation Water Bill.—The following petitions were presented in respect to this Bill:—Against it, from (1) Corporation of Wigan, (2) Millowners and riparian owners, A. B. Wood and others, (3) Owners of land proposed to be taken, Earl Bective and others, (4) Thirlmere Defence Association, (5) Ratepayers of Manchester, (6) Mary Countess Ossalinsky, (7) Rev. B. R. Lawson and others, (8) Reginald Dykes Marshall, (9) Charles Joseph Stonor, (10) Stanley Hughes Le Fleming; against alterations in it, from (1) Corporation of Oldham, (2) the Duke of Bridgewater's Trustees and the Earl of Ellesmere's Trustees, (3) Water Joint Committee of Leigh and Hindley Local Boards; in favour of and against alterations, from (1) Local Board of Atherton, (2) Local Board of Tyldesley with Shakerley; and in favour of amendment of it, from Members of the Committee of Visitors of the County Lunatic Asylum at Whittingham.

FRIDAY, MAY 24.

Nottingham Improvement (Gas, &c.) Bill,—reported with amendments. Mansfield Commissioners Gas Bill,—read the third time, and passed. Scarborough Corporation Water Bill,—read the third time, with the amendments, and passed. Petitions in favour of the Southport Water Bill were presented from Inhabitants and owners of property in Maghull and Lydiate (two petitions), Down Holland, Formby, &c.

## HOUSE OF COMMONS.

MONDAY, MAY 20.

Weston-super-Mare Improvement Commissioners Bill,—read the third time (verbal amendments made) and passed. Burton-upon-Trent Commissioners Bill (Lords),—as amended, considered; an amendment made; to be read the third time. Trowbridge Water Bill (Lords),—read a second time, and committed. Metropolis Water-Works (Purchase) Bill,—adjourned debate on amendment on second reading further adjourned to Thursday, May 23.

TUESDAY, MAY 21.

The following resolution, reported from the Standing Orders Committee, was agreed to:—"That, in the case of the Leicester Corporation Bill (Lords), the Standing Orders ought to be dispensed with; that the parties be permitted to proceed with their Bill."

The Examiners reported that the Standing Orders not previously inquired into have been complied with in the case of the Lichfield Gas Bill. Dramcundra, Clonliffe, and Glasnevin Township Bill, Grand Junction Water Bill,—reported.

Radcliffe and Pilkington Gas Bill,—read the third time, and passed.

WEDNESDAY, MAY 22.

Gas and Water Orders Confirmation Bill,—considered in Committee of the whole House, and reported.

THURSDAY, MAY 23.

The Examiners reported that the Standing Orders not previously inquired into have been complied with in the case of the Newry Gas Bill (Lords).

South Staffordshire Water Bill (Lords),—read the first time, and referred to the Examiners.

Local Government Provisional Orders (Droitwich, &c.) Bill,—considered in Committee of the whole House, and reported without amendment.

Gas and Water Orders Confirmation Bill,—as amended, considered; to be read the third time.

## URBAN WATER SUPPLY.

On the motion of the Marquis of STAFFORD, a return was ordered showing the means by which drinkable water is supplied to every Urban Sanitary District in England and Wales, such means being provided by public or private arrangements. The return should state for each district—

1. The name and population according to the census of 1871;
2. The source from which water is supplied;
3. The arrangements made for the supply, by reservoir, wells (artesian or otherwise), rivers (if filtered or not), or any other arrangements;
4. Amount of daily supply, and whether or not the supply is sufficient;
5. Whether the supply is constant or not, and the quantity used daily;
6. The rateable value of the district;
7. The capital cost of the permanent works, if any;

8. The annual payment for principal and interest on money borrowed for the works;

9. The average annual cost of maintaining the works;

10. The annual amount of the water-rates and rents, if any;

11. The Act of Parliament or other authority under which the works have been executed;

12. What improvements, if any, are considered necessary.

## METROPOLIS WATER-WORKS (PURCHASE) BILL.

Sir J. M'GAREL HOGG, in moving that the Order for the second reading of this Bill be read and discharged, said: I may perhaps be allowed to express my regret, considering the importance of the Bill, that the lateness of the session and the opposition which it has met, render it impossible to proceed with it with any chance of success. I should like it to be understood that it is not from any change of opinion on my part, or on the part of the Metropolitan Board of Works, as regards the Bill, that we take this step, for I have no doubt that when the purchase is concluded the cost will be much greater than it would have been if the Bill had been carried this session.

The Order for the second reading was then read and discharged, and the Bill withdrawn.

FRIDAY, MAY 24.

Bedlington Local Board Water Bill (Lords), Clitheroe Gas, Water, and Improvement Bill (Lords),—as amended, considered; to be read the third time.

Cheltenham Corporation Water Bill,—as amended, considered; amendments made; to be read the third time.

Bournemouth Gas and Water Bill,—reported.

Gas and Water Orders Confirmation Bill, Local Government Provisional Orders (Droitwich, &c.) Bill,—read the third time, and passed.

Sir CHARLES FORSTER gave notice that on Monday, May 27, he would moved that the Order (Jan. 30) that the Metropolis Water Supply Bill be committed, be read and discharged, and the Bill withdrawn.

## HOUSE OF COMMONS COMMITTEE.

WEDNESDAY, MARCH 20.

(Before Mr. J. HOLMS, Chairman; Mr. W. G. CARTWRIGHT, Mr. BARNE, and Mr. BOWEN; Mr. BONHAM-CARTER, Referee.)

## NOTTINGHAM WATER BILL.

## NOTTINGHAM IMPROVEMENT, GAS, AND WATER BILL.

(Continued from p. 795.)

Mr. Hawksley recalled, and further cross-examined by Mr. STEPHENS.

In May, 1875, I made a report upon a joint water scheme which I had been called upon to investigate. It comprised various places, including Hucknall. I cannot say whether that scheme was seriously entertained by the Local Authorities, or whether any action was taken upon it. It embraced provision for the supply of 26,000 people. The present population is 32,000, and it is practically the same population, with the exception of Bulwell, which we have supplied. I do not know that these districts did combine and apply for a Provisional Order. I understood that they never did combine. I believe there was a local inquiry; they quarrelled among themselves, and the matter fell through. I do not know that, having applied to the Local Government Board for a Provisional Order, a local inquiry was held, and that certain landowners, the Duke of Portland's agent and others, opposed the scheme because there were certain springs and wells that could be made available. My impression is that Bulwell was recalcitrant, and in consequence the proposed combination broke up. In 1877 a communication was made from the Hucknall Local Board to our Company, but I think it was in the nature of a mere inquiry. At that time the water was not at the boundary of Hucknall as it is now; those pipes were laid the last in the district.

Re-examined by Mr. MICHAEL: There have been large sums of money expended out of the capital provided by the Act of 1874, for works executed before that time in respect of Bestwood. Speaking in round numbers, I should say about £3000. Then there was £2500 expended upon new workshops and stores, also on improvements at the Basford works. There were also additions and improvements upon various stations, reservoirs, and wells, and certain apparatus at the works, together costing £8500; and those three sums made up the £14,000 of which I spoke yesterday. That money has been paid since 1874. There was an amount of £8000 accruing due at that time on additions and improvements of which I have spoken. This, together with the £6000 expended over four years afterwards, make up the £14,000. With regard to the £28,000, which is the main sum, that has also been expended in necessary additions. That left us practically £60,000, out of which we have had to incur expenses, that were not contemplated at the time, in the supply of the district of Bulwell. Besides that we have had certain important debts expired, and we have paid those out of the borrowed money, to the extent of £12,600; and out of an income of £35,000 we pay £160 a year upon that account. It is a straightforward lawful process. In fact, the money was borrowed by the Company for a period of years, which period expired, and the course they took was to pay out of capital, and, as occasion offered, re-borrow the money. They might have advertised for the whole amount of the loan, or they might have converted it into capital, but that they did not do. The money we now ask for I consider absolutely necessary. The £60,000 will be required if we do not make any additional station, and we do not want an additional station, because we have a service of water which we intend to supply. The extension to Bulwell has cost £7200, and is not yet completed, because, as I mentioned, we furnish all the communication-pipes at our own expense. The whole of our capital has been expended in these extensions of our system up to the boundaries of these districts. We have expended £5000 in supplying Beeston, £3500 in supplying Arnold, £7200 in Bulwell, and the usual extensions which have been forced on us by the growth of the town, amounting to about £3000 in four years, making over £12,000. That brings the amount up to £27,500, which explains as nearly as I can at the present moment the sum of £28,134. There is an additional sum for iron pipes and main-laying. The whole of the capital is paid up, and we are left with a borrowing power of £39,000, which will be borrowed as occasion requires; but it has been my advice for 50 years that, if the Company are able to do so, they should work upon shares rather than upon mortgage.

Mr. MICHAEL: The fact has been mentioned almost as a charge against the Company that their shares are at a premium in the market. Can you explain why that is?

Witness: The shares are worth 30 years purchase, because they are secure. They are as good as money deposited in the funds. It is so because of the real property which is held, the number of securities, and the large sum which has been put into the concern not bearing interest. The Shareholders are secure of their 5 per cent. dividend. But then there are other similar undertakings. I am a Shareholder in the New River Company myself, and the shares are worth 40 years purchase. This is no doubt due to the skill and economy with which the undertaking is managed, and to the great development it has received. There is no reason why the future of the undertaking should be punished because it was well managed in the past.



Mr. MICHAEL: Taking the ratepayers point of view, can you supply water cheaper to Hucknall than it could be supplied by a separate undertaking?

Witness: I have nothing here in the nature of a comparative statement; but, of course, the larger undertaking would supply more cheaply than the small undertaking. They must have a staff, an engine, and a separate line of mains, while our line of mains will, or ought to, go through Hucknall. It must go through there in the ordinary nature of things, and a supply could be given to the inhabitants with the greatest facility by means of a reservoir which we intend to make upon the road leading from Linby to Bestwood. There is a point there 440 feet high, according to the Ordnance Survey level. It would be the same water as supplied elsewhere. There would be no advantage in the time of supply. The pipe for the district is upon this very boundary. There would be no advantage arising to them from the construction of works for themselves, which we could not give them.

By the CHAIRMAN: The Trent water would not be good for household purposes, but it would be good enough for manufactures. There is a good deal of dyeing and lace getting up, and several other trades, which would not be well carried on with the Trent water, as it contains sulphate of lime. Before we came to Parliament in 1874 our capabilities were exactly the same as now, when the Bestwood works came into operation, which they did some time in 1874, after we got our Act. The rates we charge public bodies for the supply of water are—for quantities so small as 1000 gallons in a quarter of a year 10d., and for quantities so large as two million gallons 6½d. per 1000; we begin to charge 6½d. at one million gallons. The charge to the Corporation for water supplied for sanitary purposes is, I believe, 4d. per 1000 gallons—i.e., water for the street watering, sewer flushing, and so on. About one-third of the water supplied goes for trade purposes, and about two-thirds for domestic use. Last year the figures for the trade supply were 349 million gallons, and for domestic purposes 771 million gallons.

The CHAIRMAN: When you came to Parliament in 1874 for powers to borrow £100,000 you said it was likely to last for 16 or 20 years. Now you want £150,000. How long do you think that will last you?

Witness: That is a difficult question to answer. I can suggest to the Committee no reason whatever of advantage to the Local Board of Hucknall in having the supply in their own hands. They will only get into debt, whereas if they take our water this will not be the case. It would certainly cause greater expense and longer delay if they supplied themselves. Our supply is constant and large. The works are capable of supplying seven or eight million gallons a day, but the usual consumption is between three and four million gallons a day. We have also power to get water from the Trent, which we have not taken during several years. The Trent is so large that by increasing our works there we could draw ten million gallons or any other quantity we might require. There are about 200,000 people in the present and proposed districts. This population will increase probably at the rate of about 2 per cent. per annum. That is about the ordinary rate in industrial towns.

The CHAIRMAN: Have you not made a calculation as to what you are likely to do? You are asking for £150,000, and you had no parliamentary powers from 1854 to 1874—when you got £100,000, which you said would last you for 16 or 20 years. The Committee would like to know what your view is as to what you are likely to do with the £150,000 if you get power to acquire it. We should like to take down very minutely what you propose to spend. Let us begin with the works.

Witness: It will cost £60,000 to supply these new districts. We propose to supply them first from our superfluous means at Bestwood and elsewhere; therefore we shall not find it necessary to enter upon the new works you are fixing your mind upon for some years. You will find that when we begin the new works we shall want probably £50,000 or £60,000.

The CHAIRMAN: You say that the new districts will require an outlay of £60,000. What is that for?

Witness: Well, there will be a great ramification of pipes. I cannot exactly state the number of miles, and the cost per mile, but as far as I can recollect, the length, including distribution-pipes, will be 30 miles, which I think will cost about £20,000—£600 per mile. Besides that, there will be service-pipes and other things, which may be put down at £6000 or £7000. There are also the distribution reservoirs, for as the land is very undulating we shall require three of those, each of which will cost £3500. This will make another £10,000. The cost of new works and the purchase of land will be about £7500, putting the cost of land at £2500. These sums will amount to £36,000, and then we shall have to construct new works at Papplewick, which will cost about £70,000. Then we shall have to carry on the undertaking, which is always an expensive process when we have to supply new populations coming into the district. We shall not spend less than £2000 a year on an average. As to the manner in which the £70,000 will be spent, the works will consist of a large storage reservoir, holding from two to three million gallons; two engines, each of 125-horse power; buildings for the engines, and all the appliances which we have at Bestwood. We have no reason to doubt that these will be precisely the same, and that the cost will be £70,000. The well will itself cost from £10,000 to £12,000. As to coming to Parliament for borrowing powers, my own view is that the promoters should not be compelled to come every now and then. I consider that they ought always to have plenty of money. We propose to borrow the sum we ask for at 4 per cent. We have capital in hand amounting altogether to £66,300. We have some real property which the buildings have nearly reached, but it is low-lying land on the margin of the Trent, and it will require to be raised, by deposits brought from the town, some six feet higher than it is at present. The population of Eastwood parish itself is about 3500, but including Kimberley, Watnall, Moor Green, Brinsley, and Newthorpe, the population will be over 9000. The place is most distressed for want of water. The people have applied to us, both by memorial and deputation, to supply them, in consequence, no doubt, of the failure of the project which has been spoken of, and of which I was Engineer. Greasley and other places have asked us to supply them. The mining population is increasing in the neighbourhood. The Great Northern Railway have just completed a new line to supply the increasing requirements in this respect, and the Midland Railway have also constructed a new line. There has been a large increase to the population of Hucknall recently—some 3000 people have settled there, chiefly owing to a new pit having been sunk by Mr. Montague at Linby. Although the pit is at Linby, the people engaged at it reside at Hucknall. Mr. Montague is now letting out land for the erection of buildings.

By the COMMITTEE: I consider there is such a prospect of remuneration in the district proposed to be supplied, as would remove all possible unfairness. Hucknall lies in the direct route of the mains, and if we did not get parliamentary powers to go through Hucknall we should have to go round it. That would entail both some additional expense and some additional inconvenience. It is perfectly practicable to go through Hucknall. I attach importance to having the power to go through Hucknall. We have agreed to pay Mr. Montague £100 a year for the privilege of going through that district, which is out of the Papplewick district, but where we must go to get our water. We pay £200 a year for the privilege of taking water in the Papplewick district. As an Engineer, I attach im-

portance, in the execution of any scheme, to going through Hucknall. We contemplate laying down 30 miles of pipes, but of these 30 miles, only 4 or 5 miles would go through Hucknall—1½ to 1¾ miles. That would be main-piping leading to Greasley, Eastwood, and other places beyond. That would give us the facility of having the water from Papplewick in the shortest and most direct line to these places. If we did not go through Hucknall we could reach these places by going round, but it would involve additional expense for piping, the amount of which I have not calculated. I think it would be about £2000. The ground is very undulating, but that fact would not add to the expense in this respect, though it would have some effect on the service reservoir. In the event of not going through Hucknall, the ground we should have to take would be undulating, but I think not more undulating than in the other case. I think in that respect the two lines are about equal, but one line would be longer than the other, and would not possibly in all cases be along public roads.

Mr. MICHAEL said every one of the places mentioned, including Hucknall, had memorialized the Company to give them a supply, and another place called Carlton had also petitioned the House, and had presented a memorial to be included in the scheme of the Company. He had a host of witnesses who could be called, but he proposed to hand over these memorials.

The CHAIRMAN: Of what nature is the evidence of these witnesses?

Mr. MICHAEL said he did not propose to call them. He had witnesses of every description—geological, chemical, mechanical, and others—but he proposed to call the Medical Officer of the district, in order to show that, as the memorial stated, the supply of water was necessary.

Mr. STEPHENS said, if it would save his learned friend any trouble, he might admit that, with regard to Hucknall, this matter of the necessity of improving the water supply was common ground between them.

Mr. Stephen Moore, Accountant of the Company, was called to speak to their financial position. He said the statement of capital put in was correct.

Dr. Whitgreave, examined by Mr. MICHAEL.

I am the Medical Officer of Health for the Basford Rural Sanitary Authority, but not for Hucknall. The condition of the district which I represent is exceedingly bad in respect of water supply. The water is very scarce indeed, and the supply is very impure as a rule. I think the supply proposed by the present Bill of the Water Company will be a great boon to the district, and, speaking as the Medical Officer, I think it necessary that the water supply should be more efficient. Memorials have been presented from all the places within the district I represent. I appear as the Officer of Health for Carlton, where there is a very scarce supply, and where the people are even worse off than they are in some parts of the place at Eastwood. I consider it to be of the utmost importance that a supply should be provided for Carlton. In other parts of the district there is a general feeling that this supply is unnecessary. In Aysworth they have no water whatever, except what runs off the slates; with this exception they have not a gallon from year's end to year's end. In Eastwood the supply comes from a brook about a quarter of a mile from the village, and this has been analyzed and proved to be simply sewage. In Kimberley they have a few supplies in the precincts of certain breweries. These are all of excellent quality, but in the rest of the village the water is very impure. In the two Brinsleys, typhoid is very common from the impurity of the water, and even this water is difficult to obtain. I have never been in any part of England where the people were so badly off for water as they are in these districts. In Greasley, between Eastwood and Kimberley, they are very badly off, and typhoid has occurred, which was entirely due to this. I am sure there is no other source of water supply available which would be so efficient as that proposed by the Company.

Dr. C. Meymott Tidy, examined by Mr. MICHAEL.

I am Professor of Medical Jurisprudence, and Lecturer on Chemistry at the London Hospital. I have given very great attention to questions of water supply. I have visited this district, and have looked into the sources of supply. The result of my inspection was that the water was very small in quantity. I took two samples for analysis, which, I think, represent fairly the supply of Linby on the one hand, and the supply of Eastwood on the other. I took the sample at Linby from a well near the blacksmith's shop, and found that it contained a considerable proportion of common salt. I have no doubt that it was loaded with the products of sewage water. Such water would be totally unfit to drink, and would be liable to produce typhoid. The Eastwood people generally were taking their water from the Nether Green Brook, from which I took a sample, and found it was simply sewage. The water supplied by the Nottingham Company would be a great boon; it is beautiful water. I took three samples of this water—one from the old works, one from Basford, and one from Bestwood—and I found them all excellent. I think the supply to the district I have named is urgently called for. I visited Hucknall, but did not take samples of water from there. I saw that it was in want of a better supply as to quantity. In choosing a well from which to take a sample, I always took one which I thought would be fairly representative.

Mr. MICHAEL intimated that he had many other scientific witnesses to call, but

The CHAIRMAN said the Committee did not consider further evidence on this point necessary.

Mr. MICHAEL: I have excluded Hucknall in this matter; but in respect of the other places I think I have satisfied you that a supply to them is necessary and desirable.

The CHAIRMAN: Quite so.

Mr. Charles James Neale, examined by Mr. MICHAEL.

I am a Land Surveyor, and am such on the Duke of Portland's estate. His Grace owns considerable property in Hucknall—2227 acres of land and 109 houses. There are 3109 acres in Hucknall, and more than two-thirds belong to the Duke. There are also 86 houses erected by a Colliery Company on land let to them on lease. There has been a recent survey of the parish, and by a reference to the rate-books I find there are 1900 houses. The rateable value of the parish is £24,417, of which £7964 is for mines, railways, &c., leaving about £16,000; and out of that the rateable value of the Duke's property is £3148 12s. The population at the present time is estimated at 8300, giving 4·37 persons to each house. The rate-book shows that 352 persons pay their own rates—that is to say, that the rest of the rates are compounded for; 1548 houses are compounded for. They belong to 243 owners, and the rates are paid by the owners. A memorial was presented to the Company calling upon them to supply water.

Mr. Grainger, by whom the memorial was presented to the Company, was called to prove the facts.

Mr. Neale, recalled, was examined at some length as to the local feeling in favour of the Company's Bill, and stated that he was instructed by the Duke of Portland's Solicitor to give evidence in its support.

Mr. Bayley, the Solicitor just named, said, in examination by Mr. MICHAEL, that the Duke was of opinion that the Nottingham Water Company's scheme was the most desirable. He objected to that of the Hucknall Local Board.

By Mr. STEPHENS: His Grace objects to the Hucknall scheme on the



ground of expense, and he is also of opinion that it would not give as efficient and early supply as the other scheme. A clause has been prepared for insertion in the present Bill, by which the Company undertake, within three months of the passing of the measure, to supply Hucknall with water.

Mr. Cundy, Land Agent and Surveyor, acting on behalf of Mr. Montague, also gave evidence in support of the Company's Bill, as did Mr. Fisher, Solicitor to Mr. Montague. He said Mr. Montague objected to the Hucknall scheme, because they proposed to sink a well right in the middle of his property to take water, and they did not want to pay for it. He was not anxious to sell the water at all; but he had been pressed on all hands to do so, and he had consented for public reasons. If the Water Company did not obtain parliamentary powers within five years the agreement lapsed.

THURSDAY, MARCH 21.

Mr. S. Moore recalled, and cross-examined by Mr. VENABLES.

The present share capital of the Company is £350,000. The £50 shares are now sold at £75. The amount required to pay the statutory dividend is £17,500. At 30 years purchase that would be worth £525,000. If we were allowed 6 per cent., and the purchase was taken at 25 years, it would amount to the same thing.

Mr. VENABLES: I do not know whether it is within your knowledge that before the Bill came before the Committee an offer was made by the Corporation to the Company, to give annuities of 6 per cent. for the purchase of the undertaking?

Witness: I do not know it officially. I have heard that such was the case. The offer was not accepted. I believe the same offer was made in 1874.

Mr. VENABLES: I merely wish to call the attention of the Committee to the offer of the Corporation—either 30 years purchase of the present dividend, or annuities of 6 per cent.

Mr. POPE (to witness): You say the shares in the market are fetching £75—that is, where the seller is willing to sell, and the purchaser wants to buy. If the purchaser wanted to buy and the seller did not want to sell, that would, of course, increase the value. What would be the market price of a share not in the market? Because that is our position—we are not sellers, and we want our price fixed?

Witness: I cannot say.

Supposing you have an unwilling vendor, do you think that the market price has anything to do with what ought to be paid?—I cannot say.

Mr. Frederick Francis Fox, examined by Mr. POPE.

I live at Melbourne, Derbyshire, and am agent for Earl Cowper, who has large estates at Greasley. Of the supply suggested by the Nottingham Water Company I approve entirely. I think it is the best that could be obtained for the district, and one which, in my judgment, should be recommended to Parliament. There is not a sufficient supply to our district now, but this scheme of the Company would provide it. I know Hucknall, and other places included in this scheme, and they are very badly off indeed for water. In fact, I do not know a district where the supply is so deficient, and what is now obtained is impure. I believe that if a proper and healthy supply of water could be obtained building operations would largely extend. I have heard the evidence given as to the quality of the Nottingham water; I do not know anything of it personally. I cannot say that I look with any satisfaction at the suggestion of the Corporation to take over the water-works. I think the Corporation would not have the same interest in supplying those districts that the Company would have. Local interests would predominate in the Corporation. It might be to the advantage of the borough for the Corporation to take the works, but for the outlying districts I certainly think the supply is better in the hands of the Company. I look with satisfaction upon the proposal of the Company to extend their operations.

Mr. STEPHENS: Did I understand you to say something about extending the business of the Water Company? You think it is undesirable that the Company should be allowed to extend their works, and that it would be much better to allow the Local Board of Hucknall to supply the locality with water?

Witness: I said nothing of the kind. Some external districts, not within the suggested limits, are very anxious to be included within the Company's area of supply.

The CHAIRMAN: We should like to have some evidence with regard to a statement made by Sir Edmund Beckett in his opening speech, in which he says that the cost of supplying Hucknall would be £970.

Mr. POPE: That it would not exceed £970—that is the meaning of it.

Mr. J. Richardson, Agent to Lord Mexborough, the owner of large estates in the neighbourhood of Brinsley, deposed to the want of water on the property, and to the desire of his lordship that it might be supplied by the Nottingham Company.

Mr. F. Brewster, examined by Mr. POPE.

I reside at Nottingham, and am the owner of building and other land at Hucknall. I have interested myself very much in the question of water supply to the place, and I have ascertained what would be the extreme cost of supplying Hucknall with water, supposing that the Nottingham Company supplied it. The cost would be, as near as I can estimate it, £900. I arrived at that figure by taking the gross estimated rental from the poor-rate of Hucknall—viz., £28,010. I have subtracted from that the lands and farm houses assessed under Schedule B of the Property Act. They amount to £6530. Then there is the Midland Railway, £748; the Hucknall Colliery, £8470; and the rights of shooting, mills, collieries, local board office, public hall, and a few little items for places not being dwelling-houses, which will, altogether, amount to £470. That makes a total deduction of £15,223, leaving a balance of £12,787, but I should mention that the rate I have taken this from is, perhaps, twelve months old, and that there may have been a lot more houses built since, which may add some £800 or £900. I have assumed that there are 1865 houses, with an average of between £7 or £8 a house. The scale of charges of the Nottingham Company to houses of that value is seven shillings within the limits of the borough. They take power in their Bill to charge 25 per cent. more than they do now. I may say that Mr. Stevenson, the Engineer to the Local Board of Hucknall, has said that the price which would be charged if the scheme of his clients was carried out would be 13s. per house. He said that at the Local Government Board inquiry.

Cross-examined by Mr. STEPHENS: I own 13 cottages in the district. I am joint holder of 5½ acres of building land, of which I have sold a quarter, but I do not know which quarter. I am half freeholder of a siding at one of the collieries, and I have an interest as a mortgagee in several other matters. Mine is a small interest in Hucknall as compared with the Duke of Portland, but as compared with the Local Board it is very large. I am desirous there should be a good water supply to the district. I have no practical knowledge or connection with questions of water supply, except so far as my own knowledge extends. I have lived in many towns in England, on the Continent of Europe, and even in Africa, but I never saw so good a supply as the Nottingham Water Company give. I have an interest in the Company to the extent of about £200.

(To be continued.)

## Miscellaneous News.

### METROPOLIS WATER SUPPLY.

THE ABORTIVE SCHEMES OF THE METROPOLITAN BOARD.

The Builders say: "The Metropolitan Board of Works have stayed proceedings on both of their Water Bills—viz., that for the double supply of water, which was to render unnecessary the purchase of the existing undertakings, and that to authorize the purchase of the existing undertakings. We ventured to predict, some time ago, that this would be the case. But what we are not able even now to predict is, that the Board will take warning by the general opposition that the proceeding has awakened, and by the keen and destructive criticism which has been applied to these projects, and promise not to undertake any colossal measures in future without some kind of preliminary assurance that they will meet general support or public approval. Nor is the cost to the ratepayers all that has been caused by the abortive and ill-considered schemes as to which Mr. Runtz promises that 'the Board would not let the question drop.' Mr. Roche's memorable boast, 'that the Board were not afraid of expense,' seems fairly to express the sentiments of that body. We question how far the ratepayers and vestrymen will be pleased with the annual addition of even so small a sum as £12,000 to the salaries and expenditure of the professional officers of the Board, paid them for taking Bills into Parliament so drawn that their movers have not even ventured to ask for a second reading. But this sum represents only a portion of the money-cost inflicted on London, to say nothing of harass and loss of time. Every one interested in the matter appears to have done something to oppose the Bills. The Bills themselves were propounded in the teeth of the reports of the two Committees of the House of Commons—that of 1867 and that of 1869. No single good word, as far as we are aware, has been uttered in their behalf by any individual whatever, who was neither a member nor an official of the Board of Works. But our protest is on behalf of the ratepayers. It is bad enough to ask them for £12,000 to pay for the blunders of this year. But the Board, as far as their opinions are represented by Mr. Runtz and Mr. Roche, will not be contented with this. They 'will not let the matter drop.' It is, unfortunately, but too likely that as long as large parliamentary bills are annually paid, out of the pockets of the ratepayers, by a Board 'that does not fear expense,' the question will be kept alive. Surely it is a ratepayers question; and we should be glad to hear what the ratepayers have to say about it. If they are content to pay nearly double water-rates for the privilege of putting the control of the water-works in the hands of the Metropolitan Board of Works, it is not worth while to say anything more as to such a bagatelle as an annual expenditure of £12,000 for the luxury of depositing Bills for that purpose."

The Engineer says: "At the meeting of the Board, on the 10th inst., it was resolved to take steps to stay further proceedings on the Bills introduced by the Board for acquiring the water supply of London. Probably it is seen that, with a few modifications in the existing method of levying rates, and in the amount of those rates, and with the completion of the constant supply, the public will be better served by the present Companies than it would with the works in other hands, supplemented by a new scheme necessitating large outlay for a makeshift supply, and an unending expenditure for street repairs."

Major Lyon, a late member of the Metropolitan Board, writing in the *Daily News* on the lavish expenditure and reckless financing of that body, says: "I should occupy too much of your valuable space if I was to give a detailed list of the numerous Bills which the Board have introduced into Parliament only to be withdrawn. But to take the last performance of the Board in this direction, I will name the London Water Supply Bill. This Bill, promoted, we are told, at the cost of many thousand pounds, has, as usual, been withdrawn, it being too absurd to be entertained by any reasonable being. Thus we see again our money disgracefully squandered, and be it remembered that this Bill was not promoted by a large section of the Metropolitan Board of Works, but by the single vote, and then by the casting vote, of the Chairman. The division list showed 13 for promoting the ridiculous Bill, and 14 against; whereupon the Chairman gave his vote, and then his casting vote! Surely it is time to leave no stone unturned, either in Parliament or otherwise, to put a stop to such reckless waste of the ratepayers' money."

Major Bolton reports that the state of the water in the Thames and Lea was very turbid and much discoloured during nearly the whole of the month of April. In the Thames at Hampton, Molesey, and Sunbury, (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated) the water was bad on the 1st, when it became coloured, and increased in turbidity until the 9th; it then changed for the better, and improved in clearness on the 11th, from which date it again became bad, and remained in that condition for the rest of the month. The highest flood state of the river at Hampton during the month was 1 foot 10 inches above the summer level, and the lowest 3 inches below the summer level. The Thames was in a state of flood for nearly one-half of the month. The alterations in the works of the Southwark and Vauxhall Company at Battersea have put them into a more satisfactory condition, and the reconstruction of the filters is now finished. Several important alterations have recently been made to the Hampton engines of the West Middlesex Company, by which their power has been increased. A new river wall has been erected at Hampton, and a new boiler-house and two new boilers are in course of construction for Hammersmith. The slight turbidity of this Company's water referred to in Dr. Frankland's report for March last, has been traced to a fault in the immediate vicinity of the stand-post in the cab rank at Portland Road, from whence the sample was taken. The fault has been removed, and, having been purely local, the general excellent quality of the West Middlesex Company's water as supplied throughout their district was not affected thereby. It is highly satisfactory to announce that the proposed construction by the Grand Junction Company of further impounding reservoirs for subsidence at the intake at Hampton (so as to avoid the flood waters), has been decided upon by their Court of Directors, and the works will at once be commenced. These new reservoirs, when finished, will enable the Company to deliver effectually filtered water during the period when floods prevail. The filter-beds at Kew will also be put in thorough working condition, and the area thereof extended. These much needed additions and alterations will, without doubt, greatly improve the quality of this Company's supply. The Lambeth Company have given notice to commence a constant supply in a district bordered by the Kennington Park Road to the Elephant and Castle, the Walworth Road, and across Grosvenor Park, and other streets, to the point of commencement at the Company's old offices, and are also giving constant supply to a number of courts and alleys. The alterations in fittings under the Board of Trade rules and regulations are being gradually effected as occasion offers, and are carried out in all new buildings. The Directors of this Company intend proceeding with the construction of additional filters at an early date; this work is much required. The new works of the Chelsea Company at Molesey are working very satisfactorily.



## BOMBAY GAS COMPANY, LIMITED.

The Half-Yearly Meeting of this Company was held on Thursday last, at the London Offices, Great Winchester Street—D. T. EVANS, Esq., Chairman of the Company, presiding.

The following report and statement of accounts were presented:—

Your Directors have pleasure in submitting to the Shareholders a statement of accounts, duly audited, for the half year ending Dec. 31 last.

The condition of the Company is satisfactory.

The gas and meter rental shows an increase of £1135 16s. 10d. as compared with the same period last year; whilst the cost of working shows a slight decrease, and this, notwithstanding the fact that, in the period under review, a larger quantity of gas was manufactured and distributed. There has been a steady advance in the use of gas by private consumers, and this assuring feature continues.

The amount standing to the credit of profit and loss account for the half year is £10,407 5s. 11d., which, with the balance of £614 8s. 9d. brought forward, makes £11,021 14s. 8d., and after appropriating £250 to the reserve-fund, and writing off from the same £273 9s. 9d., and providing for interest on debentures, the balance of general revenue account is £10,425 4s. 8d. Out of this your Directors recommend the Shareholders to declare a dividend of 4 per cent. for the half year, free of income-tax, making 7½ per cent. for the year. This will absorb £9600, and leave a balance of £825 4s. 8d. to be carried to the credit of next half year.

The Director retiring by rotation is Henry Palfrey Stephenson, who, being eligible, offers himself for re-election.

The Auditors, Edward George Bradley and Robert King, retire from office, and, being eligible, offer themselves for re-election.

The dividend will be payable on and after the 1st of June next.

Dr.	General Balance, Dec. 31, 1877.	Cr.
Capital authorized— (50,000 shares, at £5 each— £250,000.)		Construction account . . . £203,487 16 11 Less written off preliminary expenses . . . . . 200 0 0 £203,287 16 11
40,000 shares, £5 paid . . . £200,000 0 0		Retort account . . . . . 1,103 8 6
10,000 „ „ £4 paid . . . 40,000 0 0		Services account . . . . . 73 8 1
Debentures . . . . . 6,550 0 0		Goods in transitu . . . . . 113 19 5
Amount owing by the Com- pany . . . . . 6,565 0 9		Stocks, viz.—
Reserve-fund . £8,546 12 0		Chandeliers, brackets, &c. . . 5,082 15 11
Added this half year . . . . . 250 0 0		Brass and iron goods, &c. . . 5,318 7 0
£8,796 12 0		Mains, services, and tools . . 1,806 8 4
Written off for depreciation & from prelimi- nary expenses. . . . . 273 9 9		Meters . . . . . 2,581 0 6
		Coal . . . . . 22,190 7 9
		Residual products . . . . . 2,160 18 6
		Amount owing to the Com- pany . . . . . 4,587 1 1
		Cash at bankers, on deposit, and in hand, viz.—
Insurance-fund. . . . . 8,523 2 3		In Bombay . . . . . 24,215 17 3
Passage-fund . . . . . 1,687 1 7		In London . . . . . 1,612 17 11
Balance to general revenue account . . . . . 10,425 4 8		
	£274,134 7 2	£274,134 7 2
<b>Profit and Loss Account.</b>		
Coal carbonized . . . . . £7,797 17 2		Gas and meter rental . . . £19,749 16 5
Wages . . . . . 1,220 4 11		Coke, tar, fittings, &c. . . 3,850 0 8
Purifying . . . . . 12 0 0		Interest . . . . . 279 16 10
Maintenance of retorts . . . 220 13 8		
Trade and general charges . . 861 18 0		
Salaries and Collectors com- mission . . . . . 1,595 2 4		
Rents, rates, and taxes . . . 313 6 10		
Directors and Auditors remun- eration . . . . . 626 5 0		
Bad debt . . . . . 8 14 0		
Law charges . . . . . 2 5 7		
Exchange account . . . . . 814 0 6		
Balance . . . . . 10,407 5 11		
	£23,879 13 11	£23,879 13 11
<b>General Revenue Account.</b>		
Interest on debentures . . . £346 10 0		Balance, June 30, 1877 . . £9,014 8 9
Amount carried to reserve- fund . . . . . 250 0 0		Less dividend paid Jan. 1, 1878 . . . . . 8,400 0 0
Balance carried down. . . . 10,425 4 8		£614 8 9
		Balance for half year end- ing Dec. 31, 1877 . . . 10,407 5 11
	£11,021 14 8	£11,021 14 8
		Balance for appropriation . £10,425 4 8

The CHAIRMAN: Gentlemen, it has been my custom at these meetings to amplify the report by some remarks that may be of service and interest to you. In the first place, I may be permitted to congratulate you upon the existing state of the Company. It is, I may say, flourishing; at all event, if its progress has not been rapid, it has been sound and satisfactory. Two adverse circumstances have materially affected our prosperity during the six months now under review. The first of these is the low price of coke; and this has been due to various causes, chiefly to a decreased demand, owing to the stagnation of trade; to the stop that has been put to building operations by the condition of trade in Bombay; and, last of all, to the competition of coal, which has been at a very low price, so as materially to affect the sale of coke. Our sale of coke is dependent, to some extent, upon building operations in Bombay. The lime-burners have been very large consumers; but for nearly two years that trade has fallen off to a considerable extent. Our Manager in Bombay has himself visited the kilns, and has found that one-fourth only were burning. This has, of course, operated materially against us, as regards making profit out of our coke; but I shall touch upon that subject again. The second adverse circumstance that has affected us is the loss upon exchange, and that has been very serious. On £31,000 brought over during the year the loss on exchange has been £2814. On the whole, we have got our money over under not very bad circumstances; we have brought it over during the six months at the rate of 1s. 10d. a rupee; but, nevertheless, we have suffered the loss stated. It has been unavoidable, and has been due to many causes. The chief of these, I believe, is the low price of silver, and the fact that the balance of trade has been unquestionably against India. A paragraph appeared in *The Times* of Monday last, which is very significant; it is to this effect: "The report of the trade of British India for the financial year 1877-8 shows a gross import duty of 44,771,925 rupees, against 41,790,470 rupees last year, and a gross export duty of 5,647,439 rupees, against 6,500,793 rupees last year." So that it is very manifest the trade of India has greatly fallen off; and if the Indian trade has been embarrassed and diminished, it cannot do otherwise than affect us. I think that the price of silver has been very materially kept low by the fact that Germany has poured into this country many millions more than were expected. The fact of her changing her currency from silver to gold has brought this about. Turning to our actual working, the result, in the face of all these disadvantages, has been most satisfactory. Gas and meter rental shows an increase of £1135. In the corresponding half of 1876 it was £18,614; in the last half of 1877 it was £19,417, and I am happy to say that the increase still continues. Our private lighting is steadily advancing, and the cost of working shows a slight decrease. Coal being the raw material out of which we make our profits, all that relates to it must be of interest to you. Our stock of coal on the 31st of December

was 12,585 tons, and since then shipments from Australia have been made amounting to 8500 tons. Those shipments have arrived in safety, and are now in the works, so that whatever troubles may be in store from war or any other causes, we have, at all events, 18 months supply on hand. With regard to coke, our loss has been very serious indeed. On the 31st of December, 1876, it realized £24s. 10d. per ton, but in the last half year it only brought us £1 8s. 2d., showing an adverse difference of 16s. 8d. per ton. The returns for the whole year from coke amount to £6605 18s. 9d. I now come to the next item of residual products—namely, tar. That has made a very steady advance from the first, and it continues. Its use was scarcely known in Bombay, but, as its utility becomes known, its value increases, and we are now reaping the benefit of it. The returns for the year amount to £1720 13s. 6d. The quantity of gas made was 81,543,000 cubic feet, against 75,892,000 cubic feet in the year 1876, showing an increase of 5,651,000 cubic feet. The gas sold in 1877 was 74,157,800 cubic feet, and the amount sold in 1876 was 65,582,910 cubic feet, showing an increase of 8,574,890 cubic feet. The leakage has been reduced to a minimum; at all events it is very low, being about the same as the last half year. The return is 7½ per cent., which I think Mr. Stephenson will tell you is very low. The cost of coal carbonized during the half year has been 85s. 3d. per ton; the cost in the corresponding half year of 1876 was 87s. 11d., showing a reduction in our favour of 2s. 8d. per ton. The state of our works, I am happy to say, is good. There is only the ordinary depreciation from wear and tear, which has been provided for. We shall have to repair one of our gasholders at some expense in the current year, after the monsoon. But for the loss on exchange we could have divided 1 per cent. more this year. You will bear in mind that we have been loaded with £20,000 worth of debentures. We have paid off £15,000, and we confidently expect to pay off the remaining £5000 on the 1st of January, so that the whole debenture debt will then be swept away, and the interest upon it will cease, and we shall then be in a much better condition. I do not know that I have any further remarks to make before moving the adoption of the report. I have only to give you the assurance that everything is going on satisfactorily in Bombay, and to say that a great deal is due to our zealous and active Manager there and our Officers at home.

Major SUART seconded the motion.

Mr. LOVEJOY said he thought the stock of coals was very large. Of course, it was necessary to have a good stock, so as not to be taken by surprise; but he questioned whether it was quite judicious to have so large a stock as would suffice for eighteen months. He had understood that coals deteriorated in value, and he had found in his own household that the fresher the coals were, the better. If the coals were exposed for a long time to the atmosphere, a serious loss might be sustained, because so much gas could not be made from them as if they were new and fresh. He thought it better, in the long run, to take the chance of the market than to buy in large quantities because they could be obtained cheaper.

A SHAREHOLDER inquired what securities the Company had against defaultations from their officers at Bombay.

Mr. PENNY said he had heard the report, and the observations of the Chairman, with very great satisfaction. The reasons that had been given why the profits were not greater were perfectly apparent, and they would weigh forcibly with him as an expert in regard to many other Companies with whom he was connected. Of course, if the price of coke went down, there would not be so much revenue from gas-rental. There was one thing, however, of which no mention had been made, but the importance of which Mr. Stephenson would recognize—he referred to the sale of ammoniacal liquor, which, in this country, was one of the most important residuals that a Gas Company had to deal with. A large revenue was being received from tar, and he hoped the time would come when the Company would see their way to do something with ammoniacal liquor. It was easily and inexpensively treated; and if it could not be sold in India, it might easily be disposed of somewhere else. With regard to the reserve-fund, he attached a great deal of importance to it; but he observed that the Directors had a peculiar mode of dealing with it—first placing so much to the fund, and then writing something off for depreciation. In statutory Companies in England they were not in the habit of doing that. The reserve-fund was dealt with by itself, and was used for the purpose of equalizing dividends. The Legislature had recognized that a statutory Company were fairly entitled to a reserve-fund equal to 10 per cent. of their capital. His impression was that, having due regard to the interests of the Shareholders, the sooner the reserve-fund was filled up the better; because, although it was a sucker to begin with, after a time it became a feeder. When the reserve-fund was full and invested, the interest would become a portion of the revenue; if, on the contrary, it was used in lieu of working capital, so much the better. So long as it was safe and well cared for, it was, perhaps, better used as capital by the Company than invested. He ventured to suggest, for the consideration of the Directors, that the reserve-fund should be literally a reserve-fund, and stand by itself. If there was enough profit to put something by for the reserve-fund, and also to write off something for depreciation, so much the better; but he did not quite follow the method adopted. It appeared that during the half year £260 had been put to the reserve-fund, and that £273 had been written off—a larger sum than had been put to the fund. If the Directors had continued putting a larger sum to the fund than they took off, that would not be so bad; but he did not like to see the reserve-fund standing at a smaller amount than it did. There might, however, be reasons for the course adopted, and he did not make his remarks in any carping spirit. As a Shareholder, he was perfectly satisfied with the dividend given, and he did not ask for an increase. He had heard an expression of some impatience that the concern had not progressed more rapidly, and that the Directors were not in a position to give a larger dividend; but he was himself entirely contented with the amount offered, and whatever excess of profit there might be, he was willing that it should go to the reserve-fund.

Mr. HORROCKS said that the items for chandeliers, brackets, and brass and iron goods, amounting to £10,400, appeared very large, and inquired whether any portion of that stock had been sold during the past year.

The CHAIRMAN said, with regard to the stock of coal, Shareholders would remember the time when, in the course of one year (the year 1873), the price of coal rose more than cent. per cent. The Directors had then foreseen that there would be an extraordinary demand for coal, and had provided more than two years stock, so that during that trying period they were sitting on velvet while their neighbours were in trouble. It was quite true that coal in Bombay did deteriorate by keeping; but the Directors had to consider not only the price to be paid for the coal, but the freights. It was when freights were low that they purchased large quantities. With regard to the question of security from the officers, the Manager in Bombay had given security to the extent of £2000, and the Accountant to the extent of £1000. The chief Collector had also given security, and he was responsible for the others. It was the custom to collect the accounts monthly, and no losses had been sustained. As to ammoniacal liquor, they had not yet been able to avail themselves of that product. The process would require the erection of chemical works, and he feared that the quantity of the liquor produced in the works would be insufficient to be worked profitably. As



soon, however, as they could see their way to carrying on the process with advantage, the Directors would not fail to do so.

Mr. PENNY said it was only the question of selling the sulphate, and the liquor could be turned into sulphate at little cost. He would promise an additional half per cent. dividend if the sulphate were utilized.

Mr. STEPHENSON: We have referred it twice to the Manager at my request, and there has always been a difficulty on his part.

Mr. PENNY: You must send him out the apparatus, and tell him to do it.

Mr. LINGING: The apparatus is simple and inexpensive.

Mr. PENNY: It is one of the great sources of revenue for a Gas Company.

The CHAIRMAN said the Directors would be delighted if a half or a quarter per cent. dividend could be realized by the ammoniacal liquor, and said that the matter should be borne in mind. With regard to the mode of dealing with the reserve-fund, that method had been adopted after due consideration; but he would promise that the subject should be re-considered. The item for chandeliers, &c., was much smaller than it had been, and the present stock was not larger than was absolutely wanted.

Mr. LINGING: I can recollect when it was £20,000.

Mr. STEPHENSON: £30,000.

The CHAIRMAN: We have looked very closely into it, and we will give the matter still further consideration.

The motion for the adoption of the report was then put, and unanimously adopted.

The CHAIRMAN proposed the re-election of Mr. Henry Palfrey Stephenson as a Director, and stated that that gentleman's services had been most invaluable to the Company, owing to his great experience and knowledge of gas matters, and his regular and punctual attendance at the Board.

Mr. LINGING seconded the motion, which was unanimously agreed to.

Mr. STEPHENSON, in acknowledging his re-election, said he desired to make one or two observations. He thought that the Company were making fair progress, considering that they had entered on a new contract in June, 1876, and had almost made "a leap in the dark." Their expectations had been thoroughly realized. A reduction had been made of more than £2 per lamp in the public streets, and also a considerable reduction in the price of private gas; and, notwithstanding that the previous dividend had been maintained, they could not, indeed, place the same large sums as before to the reserve-fund, but they were doing all they could in that direction. Of course they could not be responsible for the fall in the price of coke, which arose in a great measure from the fall in the coal market. If they had, however, more accommodated the price of coke to the fall in the coal market, they would not have had such a heavy stock on hand as they had on the 31st of December last—a stock which he hoped they would never see again. The Manager at Bombay, acting under the instructions of the Board, should continually keep the coke reduced so as to keep the yard clear, which he thought was the only true principle of selling coke. With regard to the question of depreciation of coal, there was no doubt that coal depreciated to a certain extent by keeping, but it was not the case with Australian so much as with English coal, and as a large portion of the supply was from Australia, they did not suffer so much from depreciation by having a large stock. Even supposing it amounted to 1s. or 1s. 6d. a ton, they had certainly saved from 8s. to 10s. a ton by taking up freights at their leisure, so as to get the advantage of low rates, instead of being obliged to take them up at any price. So far as the Company were concerned, there was no cause of anxiety in the prospect of war, because if it occurred they had a good stock of coal at low prices, and they would get good prices for coke. The contingency, therefore, of a large stock was all in their favour, and certainly not against them. With reference to the ammoniacal liquor, the Manager had been pressed on two or three occasions, and he had no doubt that the matter would again be seriously urged, in consequence of the observations of Mr. Penny. He did not see any difficulty in altering the reserve-fund in the mode suggested, and keeping it solely as a reserve fund. Mr. Penny had no doubt remarked that they had been writing off from the preliminary expenses at the rate of £400 a year, and that had been charged to the reserve-fund. He saw no reason why the fund should not be kept as a reserve to make up dividends, or to meet any special outlay. At present there were really three reserve-funds. There was the reserve-fund so called, and there was the insurance-fund, which had accumulated to £1687. The latter saved a great deal of trouble, as it enabled them to take their own risks on all shipments to the extent of £400 and under, and in a short time he hoped that they would be able, by means of the fund, to take all their sea risks, except in the case of coal, and in that case they would only take a portion of the cargo. There was also a passage-fund, which was in the nature of a reserve-fund, applicable to any passages. As to the stock of chandeliers, &c., when he first joined the Board it amounted to £30,000 or £35,000, and it was now only £10,000, and he did not think they could do with less.

Mr. E. G. Bradley and Mr. R. King were then re-elected as Auditors.

Colonel ROBINSON proposed a vote of thanks to the Chairman and Board of Directors. Although, he said, they had not been able to place the state of affairs before the Shareholders in as bright a light as they could desire, they were entitled to their gratitude for what had been accomplished in times like the present. With regard to the *bête noire*, the rate of exchange, he doubted, whether it would be better for some time to come.

Mr. PENNY, in seconding the motion, said he had been a Shareholder of the Company for many years, and he had watched its increasing prosperity with great satisfaction. A great proportion of it was, no doubt, due to the care with which the affairs of the Company had been administered.

The motion was unanimously adopted.

The CHAIRMAN acknowledged the vote of thanks, and said that the Directors had done their best hitherto, and they would continue to exert themselves for the best interests of the Company.

A vote of thanks was also given to the Manager, Secretary, and Staff, which was briefly acknowledged by the Secretary (Mr. W. Marshall), and the proceedings terminated.

#### SHEFFIELD UNITED GAS COMPANY.

A Special Meeting of Shareholders was held on the 6th inst.—Alderman MAPPER in the chair—for the purpose of considering the propriety of converting into capital the sum of £97,427, being part of the sum, by section 11 of the Sheffield Gas Act, 1866, authorized to be raised on mortgage, or some part of the said sum of £97,427.

The CHAIRMAN moved a formal resolution, creating 11,462 new shares of the Company, of £8 10s. each, to be called E shares. In the event of its being carried, he said the Directors would be able to allot every holder of £50 stock or share capital in the Company one of the proposed new shares, no matter whether the stock or share capital was fully paid up or not; and it was the intention of the Directors to make a call of £2 per share on the new shares on the 1st of July next. They considered they were entitled, in the interests of the Company, to avail themselves of the clauses which their Act of 1866 contained, and thus to repay the mortgage debt of £39,400 which now remained upon the undertaking. In the opinion of the Directors, the present was a suitable time for doing this.

From his knowledge of the Company, he had no doubt they would be able to pay such a dividend upon the new shares as had been paid upon those previously created. The new shares would be subject to the conditions of the C stock and new £10 shares—i.e., the dividend payable upon them would depend upon the price at which the Company supplied gas to the public.

The motion having been seconded,

Mr. Sissons asked whether the mortgage debt was caused by the building of the new offices, or whether it was made up of several sums.

The CHAIRMAN: Certainly not. These mortgages have been created at different times, as the Directors thought it desirable to create them.

Mr. J. WILSON asked whether the new shares would take precedence of the £10 shares in the matter of future calls.

The CHAIRMAN said that matter had not yet come before the Directors. But his individual opinion was that, after the one call had been made upon the £8 10s. shares, the calls should return to the £10 shares.

The resolution was carried.

The CHAIRMAN next moved—"That calls shall be made on the said shares at such respective times, and be of such respective amounts as the Directors for the time being of the Company shall from time to time appoint."

Mr. T. WILSON seconded the resolution, which was put and carried.

Mr. T. WATERHOUSE moved a vote of thanks to the Directors and chief Officials of the Company. In doing so he said he entirely differed from those who believed that it would be to the interest of the town if the gas-works were in the hands of the Corporation. At Manchester, where the gas-works belonged to the Corporation, the price was 3s. per 1000 feet in the city proper, and 3s. 2d. outside the township, a reduction of 1d. per 1000 being made when the consumption reached 500,000 feet per quarter. In Birmingham, where the gas-works were also in the hands of the Corporation, the quality being the same as at Sheffield, the price was 3s. 1d., reduced to 2s. 9d. when the consumption was upwards of 100,000 cubic feet per quarter. At Belfast, where precisely the same conditions existed, the price was 3s. 9d., subject to certain discounts; at Liverpool, where the works were in the hands of a Company, the price was 3s. 6d.; and at Dublin, 4s. 6d. in the town and 5s. in the country. By comparison, he found that the lowest price in Birmingham was 2s. 7½d., and the highest 3s. 1d. In Sheffield, after next month, the highest price would be 2s. 7d., and the lowest 2s. 3d.; so that at Birmingham gas was from 16 to 18 per cent. dearer than it was here. In Manchester it was from 20 to 25 per cent. higher; and in Belfast it was 30 per cent. more. These were three instances in which the gas-works were in the hands of the Corporations. He was aware that at Manchester the Corporation made a profit of about £80,000 a year from the sale of gas, and expended it in city improvements; but he considered it was unfair to large gas consumers to have to pay more than they should, in order that improvements might be effected in the centre of the city, and not in the neighbourhood of their works. The price of gas should be regulated by what it was worth; and it was a ridiculous thing to take money out of one pocket, simply to put it in the other. If the Sheffield people liked to pay 2s. 10d. per 1000 feet for their gas, instead of 2s. 7d., in order to put the difference into the hands of the Town Council, it was, in effect, nothing more nor less than increased taxation. In conclusion, he said it was self-evident that gas-works in the hands of a private Company were much better managed than they could be by a Corporation.

The motion was seconded and carried, and having been acknowledged the meeting separated.

#### "IMPROVEMENTS IN THE MANUFACTURE OF CARBURETTED HYDROGEN AND OXYHYDROGEN GAS."

The above is the title of a patent (No. 4346) obtained by Mr. John Alfred Stephan, of Worcester, manufacturer, on the 26th of November, 1877, the specification of which, filed on the 18th inst., is as follows:—

This invention relates to the manufacture of carburetted hydrogen gas from water or sewage; also to the manufacture of oxyhydrogen gas partly from the resultants of certain portions of the process employed in the manufacture of carburetted hydrogen gas.

The process is as follows:—I employ a steam-boiler to contain the water or sewage, and I prefer for this purpose a form of boiler within or beneath which I can place a retort or retorts in such position that there is sufficient space between the boiler and the retort for the fire which is to heat both. Steam being generated from the water or sewage in the boiler, it passes by means of a syphon-pipe into one end of the retort; thus communication is maintained between the boiler and the retort. The retort is fitted with a honeycombed chamber formed of a mass of closely packed metal or perforated discs or tubes, beyond which is a carburetter consisting of any suitable carbon or carbonate; that which I prefer being layers of limestone placed closely packed in the retort at a slight distance from the metal chamber, and contained in a basket or cage to admit of its ready insertion into and withdrawal from the retort. By its passage through the limestone the hydrogen gas becomes saturated with carbonic acid.

A second carburetter is placed in the retort beyond the first named, and this may consist of any suitable material which contains a large proportion of hydrocarbon, such as bones, chalk saturated with petroleum, coal, coal dust, sawdust, or creosote; or any metallic carbonates may also be used for these carburetters.

The steam from the boiler thus passes into the retort by the syphon-tube already named, and is forced through the metal chamber, which, being heated, extracts the oxygen from the steam, leaving hydrogen, the oxygen having been deposited in the iron in the form of magnetic oxide.

The hydrogen then passes on through the first carburetter, which, as before stated, I prefer should be limestone, and which is to be placed at some little distance from the metal chamber, so as to generate an accumulation of hydrogen at that point, and thus create a pressure upon the carburetter.

At this stage—that is to say, when the gas issues from the carburetter—it is carburetted hydrogen, and burns with a reddish flame, but it has then to pass through the second carburetter of hydrocarbons, after which it will burn with a brilliant, clean, and white flame.

The residuals which are valuable pass—some in the form of vapour—up the pipe from the retort and into the condenser and cooler. Others are removed from the retort in their baskets or cages.

When sewage is employed in the process, one result of its boiling is the deposition in the boiler of a dry black pitch-like substance, which is nearly pure carbon—an inodorous hydrocarbon—and which forms a very valuable material to be employed as the second carburetter for the hydrogen to pass through. The heat causes an abundance of carbon to be given off from this substance, which carbon being absorbed by the lightly carburetted hydrogen, which the gas has become by its passage through the limestone, the gas is thus rendered highly luminous, incondensable, and permanent.

In making oxyhydrogen gas, the oxide formed in the metallic chamber in the process of deoxygenizing the steam, as before named, is to be decomposed by the employment of any suitable acid, thus producing pure oxygen, which, when combined in due proportion with the hydrogen, forms oxyhydrogen gas; and, in order to effect more readily the decomposition of



this oxide by the acid, I shut off the steam from the retort, and introduce a blast of atmospheric air, by which that which was a magnetic oxide becomes a red oxide, being a sesquioxide, or peroxide of iron.

The gas once generated, as it comes from the limestone, can be employed in place of any other fuel for producing further supplies.

The claims are—"Firstly, the improvements in the manufacture of carburetted hydrogen gas by decomposing steam, and carburizing or imparting carbon to the hydrogen gas resulting therefrom, substantially as herein described.

"Secondly, The improvements in manufacturing oxyhydrogen gas, as herein more fully set forth and specified.

#### CHRISTCHURCH (NEW ZEALAND) GAS, COAL, AND COKE COMPANY, LIMITED.

The Annual General Meeting of Shareholders was held at the Company's Offices, Gloucester Street, Christchurch, on Friday, the 1st of March last—Mr. E. G. WRIGHT, Chairman of the Company, presiding.

The SECRETARY (Mr. R. C. Bishop) read the following report of the Directors:—

Your Directors are pleased at being able to place before the Shareholders upon this occasion a more satisfactory report than that of last year. This improvement is attributable to a more extended use of gas, consequent upon the extension of gas-mains throughout the city and its neighbourhood, and to the superior quality of the coal used. The Company having made experiments with the Grey River coal, find it can be used with great advantage.

During the past year the new holder and tank were completed; this holder is of a capacity of 101,000 cubic feet, and was brought into use in the early part of June, and is working satisfactorily.

The mains have been extended along Armagh Street, St. Asaph Street, Tuam Street, Hereford Street, Antigua Street, Worcester Street, Park Terrace, South Town Belt, Cathedral Square, &c., and to Avonside, covering new ground of more than three miles in length; and the necessary mains are fast coming to hand for still further extensions of about ½ miles. New beds of retorts have also been fitted up, with satisfactory results.

The Company have imported a photometer, and with it many tests have been made, showing that the illuminating power of the gas supplied to the public is of an average of 17½ standard candles, or of 22 Belmont sperm candles.

Your Directors place before you the usual statement of accounts, by which it will be seen that there remains for appropriation a balance of £3518 3s. 4d.; out of this sum your Directors recommend that a dividend be paid at the rate of 8 per cent. per annum on the paid-up capital, which will absorb £3200, and that the balance be carried forward.

It is proposed to make a further reduction in the price of gas, so as to make the net cash price to consumers 11s. 8d. per 1000 feet.

By rotation this year the retiring Directors are George Gould, Esq., and W. H. Lane, Esq. Both these gentlemen are eligible for re-election.

#### Dr.—Balance-Sheet, Dec. 31, 1877.

To Capital, viz.—				
4000 shares of £10, paid up.	£40,000	0	0	
4000 shares of £10, no call made	40,000	0	0	
	£80,000	0	0	
Debts due by the Company	303	3	6	
Bills payable	2,238	8	7	
Insurance-fund	148	0	0	
Deposits at call	5,675	0	0	
Bank of New South Wales	124	0	4	
Balance.	3,518	3	4	
	£92,005	15	9	

#### Cr.—Balance-Sheet.

By Immovable property—land and buildings	£15,116	14	0	
Additions and improvements during the year	206	9	9	
Cost of moveable property, being plant	£42,696	0	11	
Less written off for depreciation	2,000	0	0	
	£40,696	0	11	
Capital available by call	40,000	0	0	
Office furniture	86	9	7	
Funds invested on mortgage	1,700	0	0	
Shares in Investment and Loan Association	148	0	0	
Debts due to the Company	1,995	17	6	
Remittances to England connected with plant to arrive	1,424	16	6	
Stock on hand—coal and purifying material	969	15	5	
Gas-stoves	26	1	9	
Cash in hand	235	10	4	
	£92,005	15	9	

#### Dr.—Revenue Account, for the Year 1877.

To Stock—Coals and purifying materials, Jan. 1	£934	1	8	
Subsequent purchases of do.	4,286	4	6	
	£5,210	6	2	
Stock on hand, Dec. 31	969	15	5	
	£4,240	10	9	
Stock of gas-stoves, Jan. 1	£27	16	9	
Stock on hand Dec. 31	26	1	9	
	1	15	0	
General expenses, viz.—				
Wages	£2,046	9	9	
Salaries and fees	1,335	3	10	
Rent, taxes, and insurances	213	5	3	
Tools, materials, and repairs	171	16	7	
Stationery, advertising, and printing	59	18	10	
Miscellaneous	167	6	11	
	3,924	1	2	
Estimated depreciation in plant	2,000	0	0	
Discount and interest	1,647	17	5	
Bad debts marked off	46	7	10	
Balance	5,643	10	11	
	£17,574	3	1	

#### Cr.—Revenue Account.

By Sale of gas and rent of meters	£15,045	6	0	
Sale of coke, tar, and sundries	2,491	18	1	
Sale of gas-stove	1	15	0	
Transfer fees	35	4	0	
	£17,574	3	1	

The CHAIRMAN, in moving the adoption of the report, congratulated the Shareholders on the favourable result of the year's proceedings. The coal formerly used produced only 9000 feet per ton; the present coal produced about 12,000 feet per ton. The grey coal was found to be very rich in gas, and the Directors hoped to largely increase the quantity used. A call was about to be made. This had been sanctioned, in compliance with the wish of new Shareholders, but he did not think the call was necessary, as money could be borrowed by the Company on very favourable terms.

Mr. COWLISHAW seconded the motion. With regard to the call, he thought it was against the interests of the Company to make it. It was, in his judgment, absurd to make a call simply to please an infinitesimal proportion of Shareholders. He had understood that the call would not be sanctioned till after the present meeting had been held. He hoped the Directors would rescind the resolution.

In answer to questions from Mr. E. C. J. Stevens, the CHAIRMAN, stated the proposed reduction in the price of gas was 10d. per 1000 feet. In the balance-sheet for the year appeared an item of credit for depreciation; this was the commencement of a policy of making an annual allowance for depreciation of plant, &c. Sixteen shares in the Investment and Loan Association had been purchased as the commencement of an insurance-fund. The average rate of interest allowed on deposits was 6 to 7 per cent., the bulk 7 per cent.

Mr. STEVENS remarked that the Permanent Investment Society had reduced its rates to 5 per cent., and for fixed deposits 6 per cent.

Mr. GOULD and several other Shareholders disagreed with the remarks of the Chairman and Mr. Cowlshaw relative to the call.

The CHAIRMAN stated that the largest number of new shares had been taken up by holders of old shares.

The report was then adopted.

The CHAIRMAN moved the payment of £3200 as a dividend of 8 per cent. per annum, the balance to be carried forward.

Mr. COWLISHAW, seconded the motion, which was agreed to.

Messrs. G. Gould and E. C. J. Stevens were then elected Directors for the ensuing three years, and both gentlemen briefly returned thanks, and Messrs. H. E. Alport and R. Walton were re-elected Auditors.

The usual honorarium to the Directors—£50 to the Chairman, and £150 to be divided among the remainder in proportion to their attendances—was voted.

The meeting then separated.

#### WATFORD WATER SUPPLY.

Mr. Edward Easton, C.E., has, at the request of the Water Committee of the Watford Local Board, made an inspection of the district, with a view to determine whether, in his opinion, any better plan than that already suggested can be devised for providing proper pressure for the high part of the district, combined with sufficient storage.

In the report which he has submitted on the subject, he states that the population of Watford may be taken at 11,000, and the quantity of water supposed to be supplied, according to calculations based on the number of hours that pumping is carried on, 300,000 gallons daily. It is probable, he remarks, that this is not really more than 230,000 to 250,000 gallons per day, including Sundays. Looking at the probable increase of the town, 300,000 gallons per day may be taken as the maximum requirement for some years. The present storage reservoir is wholly insufficient in size, and at too low a level for the highest parts of the district.

As mentioned in a former report, he considers that the site selected for the new reservoir at Bushey is the best that can be obtained, except at a great cost for a long length of main. The height of the ground at the spot chosen is 363 feet above Ordnance datum. The highest ground in the district is 265 feet above datum, and this is higher than any of the surrounding places that might possibly be included at some future time. The height of the highest cistern at Sunbury House is 287 feet above datum. Mr. Easton is of opinion that 40 feet in the clear should be provided, if possible, above the highest ground on which houses can be built, to the working level of the water in the proposed reservoir, that is, that such level should not be less than 305 feet above datum. This, he believes, can easily be managed at the site proposed, by constructing the reservoir of concrete and rubble work, the bottom of the reservoir to be 3 feet in the ground, or at a level of 300 feet Ordnance, and the top 12 feet above ground, or 315 feet above datum. This will allow of the water being drawn down till there are 5 feet left in the reservoir, and yet allow the 40 feet margin he has mentioned. Mr. Easton expresses an opinion that, if the new reservoir be constructed on this plan, it will give an ample pressure for every house at present built, and for every house that may hereafter be built, provided the cisterns are placed at a reasonable level.

In closing his report, Mr. Easton says he had thought of recommending the Board at once to adopt the system of Deacon's meters, of which he has the highest opinion, and which have been used with great success at Liverpool, Glasgow, and other places, but as it is not certain that the figures given him as to the present consumption of water in the town are entirely reliable, he has thought it would be wise to postpone this until the new engine and pumps are started, and the real quantity pumped ascertained.

Professor Atfield has made an analysis of the well water from the Watford Water-Works, and the following is his report thereon:—

London, 17, Bloomsbury Square, W.C., March 21, 1878.

This water is entirely free from the impurities which too commonly find their way into wells. Indeed, so far as any such matter is concerned, the water is even unusually and remarkably pure.

It is somewhat hard, and, therefore, not suited for cleansing operations in which soap is used, and it is not so well fitted as a softer water would be for general cooking purposes. The hardness also prevents it being classed as a water for boilers or general steam purposes.

The analytical data are appended:—

One gallon contains the following number of grains and decimal parts of a grain of the respective substances:—

Total solid matter dried at 212° Fahr.	28.00
Ammoniacal matter yielding 10 per cent. of nitrogen	0.01
Albumenoid organic matter yielding 10 per cent. of nitrogen	None.
Nitrites	2.00
Nitrates, containing 17 per cent. of nitrogen	1.60
Chlorides, containing 60 per cent. of chlorine	17.00
Hardness (reckoned as chalk grains or degrees) removed on boiling	4.00
Unaffected by ebullition	

Total hardness . . . . . 21.00  
(Signed) JOHN ATTFIELD.

#### WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

(Continued from p. 804.)

Mr. DALZIEL (Kilmarnock) read the following paper

#### ON A NON-TILTING GAS-METER.

The subject I now bring before you—viz., that of a non-tilting gas-meter—is one, I am certain, which will be appreciated by many of my brethren. Happily some of us are so fortunately situated that a meter of this sort is not required. Others again, especially in manufacturing towns, have been much annoyed by parties tilting their meters, abstracting the water, and obtaining their gas at merely a nominal rate.

The custom of parties who are in the habit of doing this is, that after the Inspector has called and filled the meter with water, to let the meter register correctly for a few days, then tilt it forward, run off as much of the water as they can, and let it remain in that state till near the time they expect the Inspector to make his usual call; then the meter is set level, filled with water, and, as a matter of course, it is found all right when the Inspector calls, though he may be suspicious that the meter has been tampered with.

I am sorry to say that I have been much annoyed with consumers of this kind. I have been under the necessity several times of punishing, by fine, consumers for tilting and drawing water off their meters, and I have often failed in detecting parties of whom I was suspicious, on account of the hours they burned the gas, the size of the burners, or other circum-



stances, that the amount of gas registered was not anything like what it should have been.

During the winter of 1875-76, especially, my attention was directed to this matters. I was aware there were non-tilting meters that did their work efficiently, but the means taken were cumbersome, and not adapted for general use. I considered there ought to be a simple remedy to get the better of these parties, and, if possible, to make the pressure of the gas subservient to retaining the water in the meter, instead of blowing it out. In the non-tilting meter now before you I believe I have succeeded in obtaining this.

You are all aware the water in a wet meter is one of the sides of measurement, and it is only when the meter is standing level that it will give correct registration; the standard of the range in the water-line being 2 per cent. in favour of the company and 3 per cent. in favour of the consumer, being a range of 5 per cent.; but if we tilt forward a meter, this range can be increased to 10 per cent. or 12 per cent. in favour of the consumer. If we tilt forward a meter, the water in the measuring chambers of the meter flows forward into the front box, rises above the water level, and overflows into the waste water chamber, thereby lowering the water level in the drum of the meter only.

If we take a meter when newly filled with water, it registers 2 per cent. in favour of the company, but if we tilt this meter with a quarter of an inch underneath the hind feet, this will run off three-quarters of a gill of water, and register 1 per cent. less; with half an inch beneath hind feet it registers correctly.

With  $\frac{3}{4}$  inch there is 2 per cent. slow = a loss of 4 per cent.

" 1 "	" 3 "	" = "	" 5 "
" 1 $\frac{1}{4}$ "	" 5 "	" = "	" 7 "
" 1 $\frac{1}{2}$ "	" 6 "	" = "	" 8 "
" 1 $\frac{3}{4}$ "	" 7 "	" = "	" 9 "
" 2 "	" 8 "	" = "	" 10 "

And with 2  $\frac{1}{4}$  inches underneath the hind feet, the drum of the meter stops. Up to this point, there are seven gills of water run off, or, roundly, seven-tenths of a gill of water for every quarter of an inch the meter is tilted, and an average loss of gas of 1  $\frac{1}{4}$  per cent. for every quarter of an inch of tilt. Now, when we have tilted a meter 2  $\frac{1}{4}$  inches, and run off the water to point, if we gently set back the meter to 1  $\frac{1}{4}$  inches of tilt, there is still this no registration, the drum of the meter standing still; now lower it to 1  $\frac{1}{4}$  inch tilt, and the meter moves off again, but with a loss of 10 per cent., which is equal to 12 per cent. from the highest point—viz., when the meter is newly filled with water, while at the same time the supply of gas is not in the least interfered with, the reason of this being that, although fully three-quarters of a gill of water is run off for every quarter of an inch put under the hind feet, the water level is lowered only at the back of the meter, the water level being, as it were, the centre point where the angles of the water-lines converge, and although a large quantity of water is drawn off the meter, the lowering of the level in the front box is inappreciable. Its level being scarcely altered, keeps the float up, and the gas entrance open, the gas passing right through the meter without causing the drum to move, and, of course, no registration takes place.

In the valve I now bring under your notice, I believe I have succeeded in producing an effective check on all who desire to obtain gas surreptitiously by tilting the meter and drawing off the water, as no gas can be got unless the meter is standing level.

Having fitted up several meters, I found Cowan's patent side valve most suitable for my purpose. The meters of other makers fitted with this valve did not do so well, as the action of the float was intermittent, the water rising and falling with the pressure of the gas, and permitting a portion of the water to flow into the waste chamber each time the float rose and fell; but with Cowan's patent side valve, the pressure in the water level chamber is constant, and does not permit the water to rise above the water-line when the meter is tilted, but is forced down by the pressure of the gas into the back of the meter, and kept there so long as the meter is tilted, the water-line in the water-level chamber being lowered to the same extent as the pressure of the gas; that is, if there is an inch of pressure, the level will be lowered in the level chamber half an inch; if two inches, one inch, &c.

In experimenting with a Warner and Cowan meter, by tilting it forward up to a certain point there is no loss to the Company; thus the meter standing level gains 2 per cent. :—

Tilted $\frac{1}{4}$ of an inch	1 per cent. fast,
" "	" "
" "	" "
" 1 "	" "
" 1 $\frac{1}{4}$ "	" "
" 1 $\frac{1}{2}$ "	" "
And at 1 $\frac{3}{4}$ "	the meter stopped.

I came to the conclusion that, as the valve was intended for a certain class of consumers, Warner and Cowan's meter is most applicable.

In general the gas entrance to the drum of a meter is placed in the centre of the front box, between front and back. In this meter the gas entrance to the drum is brought close to the front plate, and a conical valve with back balance is placed on its mouth in the waste chamber of the meter. When the meter is standing level it is open, but when tilted forward, the balance, always hanging perpendicular, raises this valve and closes the mouth of the gas entrance to the drum, cutting off the supply of gas promptly; and, as before stated, the water, instead of flowing forward from the back of the meter, and rising above the water-line, and overflowing into the waste chamber, as in the common meter, is forced under the diaphragm back into the drum of the meter, and kept there so long as the meter is tilted, none of it overflowing into the waste chamber. The instant the meter is put into its proper position again, the water flows back to its natural level, and registration goes on correctly as before. I consider this to be a most important advantage—viz., the retention of the water when the meter is tilted. I would especially draw your attention to this point, which is one of the strongest recommendations to the use of this valve; it is as good as a spirit-level; you can set it to cause the gas to go out at any point, one-eighth or one-fourth of an inch; but I find for general use, with three-fourths of an inch of tilt, that is, under the hind feet, it is quite sufficient as a check on tilters, and is an ample margin to keep the valve open when the meter is sitting level.

Suppose, again, that the gas should be turned off, and the meter tilted, the water will run off, as it has not the pressure of the gas to retain the water; but as the valve, on the entrance to the drum, is closed, the supply of gas is effectually cut off, so there is no help for a consumer who tilts but to set his meter level again; but as the water has been drawn off, although the valve is open, down goes the float, and again cuts off the supply of gas, so there is no help for a consumer of this class but to fill up his meter with water, and let it stand level. By adding this valve to the meter, gas companies are doubly protected, and gas managers have an efficient check on consumers guilty of these practices.

I have got a number of Warner and Cowan's meters fitted with this valve, the working of which has been most satisfactory. Two years ago I put on some of Warner and Cowan's meters to several parties who were guilty of tilting; but it was of no avail, as, when brought forward, it is like

other meters—viz., the compartments of the drum of the meter being unsealed by the water being run off. Seeing I had not improved my position, it was only after a good deal of time and trouble I have been able to circumvent them. In every case in which it has been applied it has wrought admirably. Now, when I have tested its efficiency, where I have the least suspicion, instead of watching, I put on a meter at once, and the result generally has been a large increase to the gas accounts of these parties, compared with the corresponding period of the former year. These parties, when they find the gas goes out if the meter is tilted forward, or if they draw water off the float goes down, will give up further attempts to obtain gas in this way.

A curious incident in connection with this is, that I invariably find those consumers who interest themselves in inquiring how much their neighbours consume, are fit subjects for a non-tilting meter. Their immunity from what their neighbours consider heavy gas accounts—who wonder how A could use so little and B so much gas, seeing that B went to bed early, and A sat up the most of the night—was a puzzle they could not get over. I now make it a rule, when the inspector comes across one of this class, who tell him they are only so and so, and inquisitive as to their neighbours accounts, to put one of these valve meters on at once, the result generally being a statement much in excess of what they used to pay.

As gas managers, those of us who have meter inspectors are much indebted to those who discharge their duties faithfully. The question is often asked, "How many cubic feet of gas do you make per ton of coal?" I think a more practical question is, "How much do you sell per ton?" as it is by what we sell our profits are made, so I consider a faithful inspector of meters is invaluable. Now that I have proved this meter to be effective, my inspectors find themselves relieved from one of the most disagreeable and irksome of their duties in connection with their office, as they have found that when a meter with this valve is put on to suspicious customers, it not only tells against the individual, but has a wholesome effect upon the neighbourhood. As a rule, you will find these parties are grouped together. When you find one in a locality, you may be certain others of the same sort are not far off.

I will now read you a few of the results of the working of the meter with this valve:—

Year.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	Trade.
1877 Common Meter	—	—	200	200	200	700	200	300	300	Tailor.
1878 Non-tilting Meter	—	—	600	500	400	500	500	400	300	—
1877 Common Meter	400	200	300	400	900	500	200	—	—	Brass Finisher.
1878 Non-tilting Meter	—	—	—	—	—	—	—	—	—	—
1877 Common Meter	400	200	200	200	400	200	—	—	500	Engineer.
1878 Non-tilting Meter	—	—	—	—	—	—	700	400	400	—
1877 Common Meter	—	—	—	—	600	600	500	300	200	Engineer.
1878 Non-tilting Meter	—	—	—	—	—	000	1000	800	700	—
1877 Common Meter	—	—	—	000	800	000	500	300	200	—
1878 Non-tilting Meter	—	—	300	700	600	600	300	300	200	—
1877 Common Meter	—	—	—	400	300	600	000	000	000	Hammerman
1878 Non-tilting Meter	—	—	—	400	800	700	500	300	200	—
1877 Common Meter	—	—	—	—	—	300	300	200	100	One of small means.
1878 Non-tilting Meter	—	—	—	—	—	—	600	400	300	Writer.
1877 Common Meter	—	200	300	300	300	400	300	200	100	Weaver.
1878 Non-tilting Meter	—	400	700	800	700	900	600	400	300	—
1877 Common Meter	—	—	—	300	300	400	300	200	100	Engineer.
1878 Non-tilting Meter	—	—	—	1000	1200	1400	600	1000	760	—

Now, what is the moral of all this? That we, as Managers, should do the best we can in furthering the interests—and these are genuine British interests—of our employers, not only in taking the most we can out of the coal and other materials supplied to us, but also to see to it, in the distribution, not only that our mains are sufficiently large and our service-pipes sound, but that our meters are the best that can be got, so that it will be out of the power of any consumer of gas to get more than he is entitled to, and that every company may realize every cubic foot of gas that passes through their meters.

The PRESIDENT: I am sure we are all indebted to Mr. Dalziel for his paper on this subject. It is one, however, that, perhaps, the least we say about it the better for ourselves, because many, if they knew how, might try their hands at tilting meters. At present very few practice this dishonest process; but at the same time it is well to have the power of checking these very few. Therefore, Mr. Dalziel deserves credit for the meter-valve he has invented. I would like to ask whether the gas-valve increases the price of the meter.

Mr. DALZIEL: I forgot to state that the parties of whom I have made mention were not caught tilting. It was only when we found neighbours saying they could not understand how So-and-so was charged so little for gas that the new meter was brought into play.

Mr. RICHMOND (Whitburn): Eighteen years ago I was greatly troubled by people tilting their meters; but I managed to put an end to the practice by introducing the dry meter. This meter is quite handy. I have not had a case of tilting for sixteen years.

Mr. CARLOW (Port Glasgow): The Port Glasgow Corporation bought a number of Mr. Dalziel's meters lately, and we have found them to be of great advantage. We were troubled with suspicions about parties, and we fixed these meters at their premises, and the results have been very satisfactory, although only a few months have elapsed since their introduction. I am not in a position to give actual results, but at some future meeting I will lay statistics before the meeting, to show the advantages derivable from the adoption of this meter.

Mr. ATKEN: I thought this was a question entirely pertinent to Kilmarnock, and that there was not another town in Scotland in which a Gas Manager could come forward and complain of his customers; but, from what we have heard, there are other towns in the same position, and perhaps you will consider, this being a question of morality, whether you should not inform the Commission about to sit as to the morals of such and such a place.

Mr. SCOTT (Superintendent of the Meter Department, Glasgow): I must say the principle of this meter is very good. I have much experience both of wet and dry meters, and I find the dry meter is very good where it has its work to do—that is, a 5-light meter passing 30 feet per hour; but if you take a fourth off that as being the quantity used for a certain time, it is a question whether the consumer does not get more than the quantity he is charged for. Therefore, I have always been in favour of the wet meter as the most correct measure in use—that is, always provided you get a perfect meter; and, so far as I have seen, this appears to me to be a very perfect measure. I may tell you that it is the Laidlaw meter that we principally use. The spout goes into centre of the cylinder. It does not matter how you tilt this meter, you cannot take off the water, because the spout is the water-line, and it is as near the centre of the measure as you can have it. And, tilt it as you may, the variation of the measure is very little—I do not think above 2 per cent. I would advise all Gas Managers, if they want accurate measurement, they should go in for wet meters, and test them regularly, and there is no fear of a good return. I have a system of testing dry meters in Glasgow. By means of a mechanical arrangement,



tested by experiments at the works, the Inspector can easily detect whether a dry meter is registering properly or not.

Mr. WATSON (Stirling): Is this meter of Mr. Dalziel a patent?

Mr. DALZIEL: It is merely registered.

Mr. WATSON: How many have you in use?

Mr. DALZIEL: I have a dozen just now; but I am getting more.

Mr. WATSON: Can you, by using this meter, reduce the per centage of unaccounted-for gas? I expect, if you had 200, or 300, or 1000 of these meters in use, that your leakage would be considerably reduced.

Mr. HUTCHISON (Portrush): From my experience nothing beats the old style of wet meter, provided proper attention is paid to it. With this attention there is no danger of the Company being defrauded. I must confess, however, that, when a Manager is dependent on Inspectors, who are mostly ignorant of the construction of a meter, there is nothing better than a good check. In that view I much approve of the principle of Mr. Dalziel's meter. When the index is taken, not by the Manager, as in small towns, but by Inspectors, it is invaluable that the Manager should have a meter on which he can place reliance. In comparing one year with another, I have found considerable differences in the returns, more especially with dry meters.

Mr. DALZIEL: The improvement only adds 5 per cent. to the cost of the meter. The most of the parties to whom I have referred have paid the additional cost in the first month. From my experience of dry meters, I will have nothing to do with them, if I can help it. I saw from the JOURNAL OF GAS LIGHTING that there was not a single dry meter in the whole of France. As regards the morality of Kilmarnock, that is a touchy point. The defaulters, however, are, in this instance, not Kilmarnock people; they mostly come from other places. Kilmarnock, therefore, is clear of this stigma. As to the reduction of leakage, I may say that Kilmarnock is a town that radiates from a centre in long streets, like a spider with long legs. I send the gas out from the centre in all directions, to the distance of one, two, or three miles; so that the leakage is about 14 per cent. I do not expect that the adoption of this meter will reduce the unaccounted-for gas very materially; but I consider that it is a meter which will make everybody pay what is right.

On the motion of Mr. LEVI MONK, a vote of thanks was awarded to Mr. Dalziel.

Mr. D. M. NELSON (Glasgow) read the following paper on

#### STEEL'S PATENT GRADUATORY GAS SCRUBBING, CONDENSING, AND PURIFYING APPARATUS.

In bringing the present short paper before this Association, it may not be out of place in me to say a word concerning the gentleman on whose behalf I appear, simply by way of introduction. Not that he is unknown in the world of engineering skill and enterprise, or that he has even been altogether isolated from the special section of engineering industry, to which we, as an Association, are more or less allied, but rather because he is, personally, somewhat of a stranger to most of you. I may say, however, that, as a practical engineer and a brewer, he has done much to improve the quality and cheapen our glass of beer or stout by his improvements upon refrigeratory and other apparatus; that one of his inventions is what is known as the Steel and McInnes Railway Brake, a brake that has yet to be proved second to any other on trial at the present time; also that he has just published a work on brewing, which commands the price of ten guineas per copy.

Having thus briefly referred to these points in Mr. Steel's personal history, you may feel justified in believing that the process or system he propounds for the purification of gas is worth, at the very least, a few minutes of your consideration. He is desirous of gaining instruction and advice from you, while none the less willing to make himself useful to this or any kindred Association with which he may be brought into communion.

The machinery shown is meant to represent a method of purifying gas by what may be called a continuous graduatory process, and, at the same time, provide a simpler method of purification than at present in use. A pretty full description of this apparatus is given in the "Register of New Patents" column, JOURNAL OF GAS LIGHTING, March 26, 1878, page 488.

The system ought to be made up of two long cylinders, one supplied with pure water for de-ammoniating the gas, the other for extracting the sulphur and carbonic acid by means of lime water, or milk of lime. To show one of these cylinders will at present be quite sufficient for the purpose of explaining the arrangement, that cylinder being the one devoted to the cooling and scrubbing operation. The purifying process is quite similar, the liquid lime being used instead of the pure water. In both cylinders the absorbing media should travel the reverse way of that in which the gas travels, so that in reaching the end of discharge, the gas, in a state approaching to purity, meets the pure water, or clean milk of lime, entering and moving in the opposite direction, at the reverse ends. On its entering, the gas will, of course, encounter the absorbents, rendered as foul as can be allowed in practice, and ready for discharging. Thus the foul gas encounters the foul media of cleansing, and the pure gas the pure media.

The process is akin to what is called the "sparging" system, employed by brewers in the extraction of the saccharine products from malt—viz., that of sprinkling pure water on the top of the grains in the mash-tun, and causing it to filter downwards, absorbing as it goes the substance of the malt, and increasing in gravity as it passes towards the bottom, where it drains out in full strength. This sparging operation is performed vertically, and is much simpler than the method which must be employed with gas. Here we must work horizontally; and the writer thinks a perfect horizontal the best position in which to place the cylinders, as thus the absorbents will be retarded, rather than otherwise, in their passage through.

For the purpose of retardation, diaphragms are attached at suitable distances along the cylinders. These, it is supposed, will, while cutting the body of the liquor into sections, keep each sectional quantity very much by itself in the intervals between the periods of supply, and so have the strength or foulness, and that of purity of the absorbents, in a state of graduation from one end of the cylinders to the other, to secure for them the greatest amount of saturation at the point of outlet.

To describe the machine shortly, let us deal with one end for the ammonia. To this the gas is supposed to enter, and be supplied with water from a cistern, by means of cocks, together with some suitable pipe or connection. In action, however, previous to supplying pure water by the cocks, a quantity of liquor would have been drained off the opposite end of the cylinder and discharged into the tar pit or chest, through other cocks. The quantities run in and off must be measured in some way, and a general level maintained in the cylinders by arrangements of detail made for the purpose. Experiments are required to give dimensions.

After passing the ammonia cylinder, the gas enters the division for dealing with the sulphur, &c., and the action of the gas going the one way and the absorbent the other is repeated. The lime is supposed to be dissolved in a cistern, by some simple rousing apparatus, and run, as in the case of the water, into the proper end of the cylinder, there to move to

the reverse end and be discharged into a pit or chest corresponding to that employed for the tar.

Objections were wont to be made to the use of lime in solution—its smell, and the difficulty in disposing of it, were both complained of; but a greater difficulty stood in the way—viz., the imperfect method of application. The writer has seen nothing better proposed than a fixed vessel, which, to fetch the principle home to us, might be called a pot for containing the wet lime, and into this, to some depth, as a necessity, the gas had to be forced for contact. Apart from the bad effects of forcing, the result was not good, for the gas went through in belches, and was but indifferently purified. This meagre purification, too, could only be had when the lime was newly put in and quite fluid, for it soon became too viscid to be penetrated, and too impure for purification.

The proposals of Mr. Steel obviate both the evils of viscosity and those of impurity, while recent proposals to use up effete gas-purifying products is likely to give a market for the contents of the liquid lime pit. In proof of this, I refer to an article which appeared in the columns of the JOURNAL OF GAS LIGHTING a week or two ago.

The question of whether the cylindrical or other shaped vessels should revolve, or be stationary, with shafts and arms to distribute the media of absorption, has been considered, but is not decided on by the patentee. The thorough mixing of the gas and liquor is of the first importance, but there are so many ways of doing it, that it is left in the meantime for discussion and experiment.

Fixed cylinders have the advantage that the fresh water, lime water, or milk of lime could be applied, and the products abstracted without any stoppage of machinery or the interruption of the process, while the rotating vessels will require special adaptations for this end. But this paper is read in the hope of showing a principle and means of gas purification yet virgin and untouched by gas makers, and which, it is thought, will give superior results to methods now being followed.

As regards the general improvement and simplifying of gas-making, (apart from purification) by the introduction of this system, it is supposed that the long purifying cylinders will allow of the condensers being done away with, as the exposure of the gas to the large superficies, with the thin material of the cylinders, will cool it amply in winter, and in summer the cooling deficiency can be made up artificially, by a sprinkling of water from pipes.

The cylinders being substitutes for the ammonia washer and the dry lime purifiers, it follows, if we can drop the condensers, that the cylinders at once take the place of all three. By this method all pressure is taken off the gas in its progress to the gasholder, and the only exhaustion required is the quantity of power to uplift this when being filled.

With the waste heat at disposal in the retort-flues of gas-works, the question of power to work this system need not enter into either calculation or discussion, and so with the cost of up-keep. This cannot be more than that required for the present apparatus, while the labour will be much less than that expended on the purifiers, &c., of the present day. It looks as if Mr. Steel's system was attracting the favourable notice of Gas Engineers, as one or two patents trenching upon his ideas have been taken out recently, and the writer will now be glad to hear the views of the gentlemen of the West of Scotland Gas Managers Association on the matter.

In continuation of my paper, I may remark further that Mr. Steel in his patent foresaw that revolving shafts might be used instead of the revolving cylinder, and he now thinks that the cylinders ought to be made larger in diameter than he at first anticipated—say 6 or 8 feet—so that men, in cleaning or repairing the interior, may be able to move about freely. Cylinders so large as this would be inconvenient to work on the revolving principle, and Mr. Steel now prefers the shaft with light arms to whisk the water about, mix the gas and water, and cause the gas even to strike down on the solid water creeping along the bottom of the vessel. In this case the vessel may be made round, square, or oval; possibly have a flat bottom, and a high oval or round top. With the flat bottom, the liquors might get a longer travel by moving zigzag, crosswise, with switching arms in each division.

But, as has been already indicated, the method is flexible in the extreme, and may be adapted to work in many ways. In these proposals, with the whisking arms and spoon or paddle float ends particularly, there would be no need of wood grids, or other form of scrubbing power, so that the labour, great or little, would be restricted to that of keeping the bottom clear of obstruction.

After the reading of the paper, it was proposed to postpone further discussion until the next half-yearly meeting, when Mr. Nelson hoped to have an opportunity of bringing forward more information on the subject. This was agreed to.

#### EXHIBITS.

The thanks of the Association were accorded to Mr. Foulis for his kindness in sending his lamplighter, which was explained by Mr. Scott.

A vote of thanks was also given to Messrs. W. and B. Cowan, and Mr. Nelson, for the articles exhibited, and also to Mr. Christie, of the Argyle Ironmongery Company.

#### VOTE OF THANKS TO THE PRESIDENT.

Mr. MITCHELL: I have to propose a hearty vote of thanks to Mr. McGilchrist, for the able manner in which he has discharged his duties as President during the year which has just closed.

The President responded, and concluded by moving a vote of thanks to Mr. Carlow, Secretary, who, he said, had really done all the work.

Mr. CARLOW, in reply, said that in anything he had done for the Association he had had great pleasure, and he would always be glad to put his services at the disposal of the Association.

#### NEXT MEETING.

It was unanimously agreed that the next meeting should be held at Kilmarnock.

On the motion of Mr. NELSON, a vote of thanks was given to the Committee of the Industrial Museum, who, through Mr. Young, Curator, had done so much to facilitate the comfort and convenience of the members.

#### THE REVIVIFICATION OF LIME.

The members then adjourned to Paisley Gas-Works, where the Manager, Mr. G. R. Hislop, conducted them through the works, and explained his process for revivifying lime.

Having partaken of some refreshments,

Mr. HISLOP said: Mr. President and Gentlemen,—I very highly value the honour conferred upon me and upon our town, in having appointed Paisley as the place of your meeting at this time, and above all I feel grateful to you for having elected me an honorary member of your Association, and for the kind interest taken in my process for the revivification of spent lime, and for the expression of that interest which your presence here to-day conveys to me. In addition to the mechanical description of the lime-revivifying chambers, to which you kindly listened a few minutes ago, I am glad to have this further opportunity of making a few observations on the practical working and general results obtained by the process. At the outset I need scarcely advert to the many occasions, such as the present, upon which the subject of utilizing spent lime has been discussed—and that not only in Scotland, but in England



and elsewhere. You already know that I have for several years past been directing my attention to realize that object, and I venture to say that my efforts have not been fruitless; since, in addition to a considerable saving in the cost of lime, all the workmen can testify to the very great convenience that has been experienced in its use—considered in relation to the amount of land occupied by the raw material (limestone) and by the spent lime, which unitedly, in winter, commonly amounted to from 500 to 800 tons, and besides this, the exposure of men calcining stone during all seasons, and also the similarly disagreeable work of screening and preparing the new lime, which is very largely reduced in the preparation of the recalcined lime. The plan I follow out in ordinary practice is the employment of oxide of iron in conjunction with the lime, and by changing something like two of the former to one of the latter, the whole of the lime is completely desulphuretted by means of the carbonic acid contained in the foul gas. Lime that is employed in this way is found to contain, after some 56 recalcinations, only about 2 per cent. of sulphur. Another part of my process, and intended specially for works in which the purifiers are not arranged for the use of oxide of iron, is to draw, by a suitable exhauster, the carbonic acid gas from the chimney, and pass it up through the foul lime in the purifier, in order to displace the sulphuretted hydrogen, which is recovered, into oxide of iron contained in a separate purifier or chamber; and after recalcination caustic lime is recovered. I am presently making a certain series of experiments, and amongst these, that of recalcining lime fully saturated with all impurities, and after seven restorations it contains about  $\frac{4}{5}$  per cent. of sulphur. My friend, Mr. Stewart, has had the process in operation in the Greenock Gas-Works for some months, and it continues to give satisfaction; but since its introduction there I have decided upon certain important modifications and improvements, which will, I feel confident, considerably increase the product of quicklime. Within these last few days Mr. Young, of Clippens, and myself have patented another arrangement, intended to take the place of the chambers you have just inspected—namely, a rotating or oscillating retort, as referred to by your President to-day, and which will be of special value to the larger Gas Companies and Corporations. It will be necessary only to feed in and draw out the lime, and consequently reduce the labour to a minimum. An ordinary boiler-shell is lined with fire-clay, and may consist of one or several tubes; and these, again, may have longitudinal or spiral ribs through them in order to expose the largest amount of surface. The tube is inclined towards a furnace and a receptacle for the burnt lime, and the heat given off during the process of cooling is utilized in increasing the temperature of the lime under recalcination. And something like 24 to 25 cwt. of quick lime per shift per man may be realized by my first process, and at about one-half of the original cost; probably considerably more by the rotating retort. In practice, from 50 to 60 per cwt. of the crude lime is returned as quicklime. With regard to the applicability of this process to small gas-works, it may be introduced with advantage into works of any size, from 3,000,000 feet per annum and upwards. It not unfrequently happens that a man has unavoidably to be taken into service when there is not more than half work for him, and until an increased consumption of gas brings his full complement of work, I would in such cases utilize his time by heating up the lime-reviving chambers, and store up the burnt lime. As, depend upon it, you cannot err in having lime prepared a considerable time before its application in the purifiers, any carbonate that may form on its surface by exposure to the atmosphere being perfectly insignificant. In conclusion, I trust that our efforts will be crowned with that measure of success as will secure the profitable utilization of that material which has so long been held to be a nuisance and an abomination. In a word, I once more thank you, gentlemen, for having afforded me this opportunity of explaining my process.

#### THE DINNER.

In the afternoon a large company sat down to dinner in the George Hotel. Mr. McGilchrist discharged the duties of Chairman, the Croupiers being Messrs. Nelson and MacLeod. Song and sentiment succeeded each other, and a pleasant evening was spent.

#### LAMBETH WATER-WORKS COMPANY.

The Ordinary Half-Yearly General Meeting is to be held this day, when the following report of the Directors will be submitted:—

The accounts for the half year ended March 31, 1878, having being certified as correct by the Auditor appointed by the Board of Trade, under the Metropolis Water Act, 1871, and by the Company's Auditors, are now presented to the Shareholders.

During the half year, 1109 houses and other supplies have been laid on to the Company's works at a rental of £2309 6s.

The capital account No. 2, shows an expenditure in the six months of £16,565 11s. 1d., which leaves a debit balance of £4354 16s., but this sum includes the value of stocks in hand.

The bond and debenture debt at the end of the half year was £157,165, which has been reduced by the payment of £15,400 on the 1st of May.

The 4 per cent. debenture stock stood at £50,000 on the 31st of March, but has been increased by a third issue of £25,000, which was made payable in full on the 1st of May. For this issue applications amounting to £105,735 were received from 173 Proprietors, holding £339,025 share capital. The Directors allotted the stock, as before, proportionately amongst the Proprietors according to their holdings of shares. Fresh issues will be made by the Directors under the authority granted by special resolution of the Proprietors, at such times and in such manner as may be necessary for the purposes of the Company.

The surplus transferred from the revenue account, No. 3, to the dividend and interest account, No. 4, is £39,302 11s. 7d. After payment of interest on the bond and debenture debt and the debenture stock, there remains an available sum of £37,365 6s. 4d., out of which the Directors recommend to the Proprietors the distribution of a dividend for the half year ended March 31, 1878, at the rate of  $\frac{6}{5}$  per cent. per annum, which, less the income-tax, will, it is estimated, amount to £34,630, leaving a balance of £2735 to be carried forward.

The Engineer reports the completion of the duplicate 12-inch pumping-main from the Brixton works to Selhurst reservoir, referred to in the last report, and that the whole of the Company's works, including reservoirs, pumping-engines, main-pipes, &c., &c., are in good repair and efficient working condition.

Notice has been given of the Company's intention to begin giving a constant supply of water to the town district. The locality selected for making a commencement being that lying between the Kennington Park and the Walworth Roads, in the Parish of St. Mary, Newington. When the house fittings are in order, and the constant supply effected in this block, the system will be gradually extended over successive blocks or divisions of the district, until the whole is supplied on the same system.

The Directors have to report that the staff of the Company is now concentrated in commodious and convenient offices, at the works, Brixton Hill, and that the lease of the old offices in Kennington Park Road has been disposed of.

The Metropolitan Board of Works, as the Proprietors are aware, introduced two Bills in Parliament at the beginning of the present Session,

with the object of obtaining the control of the London Water Supply. The public Bill for the acquisition of the Companies, by purchase on an open arbitration, was manifestly unjust. The private Bill for the introduction of a high-pressure supply, to be obtained from distant sources, for drinking and fire-extinguishing purposes, appeared to be a scheme which was certainly ill-considered and probably utterly impracticable. These Bills have now been withdrawn, but all the Metropolitan Water Companies have been put to very considerable expense in opposing them; and much public money must have been expended by the Metropolitan Board of Works in their promotion. The public consideration of the question, however, has elicited the fact that the water supplied by the London Companies is extremely good in quality and ample in quantity. As evidence that the requirements of the public have been of the first consideration to the Directors and Proprietors, it may be here stated that £392,582 4s. 6d. have been expended on capital account by the Lambeth Company since March 31, 1871 (when the Metropolis Water Act was passed), with the object of maintaining and improving the purity of the water, and increasing the facilities of its storage and distribution.

The following Directors, Mr. John Deedes, Mr. John Boustead, Mr. Edward Thomas Edmonds Besley, and Mr. Robert Stopford, retire by rotation this year, but, being eligible, offer themselves for re-election.

The Auditor who retires by rotation this year, and who offers himself for re-election, is Mr. Burroughs Dickie Kershaw.

#### THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade throughout this district continues in a very depressed condition, and, to effect business, sales have to be pushed at extremely low prices. This is especially the case with regard to gas-making coals, and the general complaint is that the business doing in these is of a very unsatisfactory character, as the keen competition for contracts prevents anything like a legitimate price being obtained. The better classes of round coal, suitable for house-fire purposes, are, of course, only in very moderate demand, and the depression in the iron trade, together with the strike at the cotton mills, causes other classes of fuel to be a complete drag in the market. Prices generally have a downward tendency, and in the Manchester district reductions in the list rates, to come into force at the end of the present month, have been decided upon by the leading firms; whilst in other districts prices are gradually being cut down to meet the demands of consumers. The average quotation at the pit mouth may be given at about 9s. to 10s. per ton for best Wigan Arley, 7s. 6d. to 8s. for common ditto, 7s. to 8s. for Pemberton four-feet, 5s. to 6s. for common coal, 4s. 6d. to 5s. for burgy, and about 3s. 6d. per ton for good slack.

The reduction of wages in the Oldham district has led to a turn-out of the men. The notices expired on Wednesday, and on Thursday the miners at about 14 pits struck work.

The iron trade shows no sign of improvement, and there is very little doing either in the raw or manufactured materials. Some of the outside brands of pig iron continue to be pushed in this district at such low prices that local producers have little or no chance of securing business, and stocks are accumulating at the Lancashire works, but nominally the list prices are without change. In finished iron the makers of the better brands are generally steady at late rates, but low-class irons are offered at very low figures.

Works are all very slack, and many of them are partially stopped.

Messrs. Dobson and Barlow, of Bolton, one of the largest ironfounding firms in the district, have served notices on their men of a reduction in wages of 5 per cent.

#### THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the North of England alters very little; the demand for best gas coals at a few of the leading Durham collieries is pretty steady for the season of the year. All the other collieries have a "scrambling" sort of time of it. Second-class gas coals are sold for manufacturing, steam, or whatever sort of use people are inclined to put them to. "No reasonable offers are refused" by colliery offices. Quotations are about as follows:—Best, 7s. to 7s. 6d.—mostly 7s.—per ton, less  $2\frac{1}{2}$  per cent. discount; seconds, from 6s. to 6s. 6d. per ton, with the same discount. The steam coal trade is fairly well, especially for best sorts for exportation to India and the Mediterranean. Rates are—Best, 10s. per ton, with from  $2\frac{1}{2}$  to 5 per cent. discount; seconds, from 8s. to 8s. 6d. per ton, with similar discounts. Shipping turns for gas are ready; it may be written immediate. Notwithstanding that there was a scanty supply of vessels in the coal ports last week coasting rates favoured shippers; there were few orders in the market. From 5s. 1½d. to 5s. 3d. per ton was paid sailing vessels to load gas coals to be delivered at the wharves in London river. The figures for steamers were from 4s. 3d. to 4s. 6d. per ton for London. Little more than 5s. a ton was offered to sailing vessels to load coals for the east coast; rates were extremely low for the Channel ports also. There was a rise of about 10s. a keel in coal rates to Cronstadt. There was no change in freights to the lower ports of the Baltic; there was a fall, however, of from £1 to £2 a keel upon the freights of coal exported to the Mediterranean and Black Sea.

The external prospects of the coal trade alter very materially with the rise and fall in the political situation. If there were a settlement of the Eastern difficulty there would to some extent be a revival of prosperity in the iron trade, and a better coal trade. The iron trade of the North is likely to be subject to a good few changes. Steel rails are in request, and some of the factories in Middlesbrough are about to be changed from manufacturing iron to steel works. The iron trade is without any material alteration; it is extremely quiet.

There is little demand for fire-clay goods, fire-bricks, cement, manufactured iron for furnaces, or machinery for factories abroad, and the shipments by steamers to the Continent are limited. Some part cargoes of Cleveland pig iron were sent from the Tyne last week to Rotterdam, Cronstadt, and some other foreign ports. Gas and water pipes were shipped for abroad and the South of England, but the shipments were not large. The chemical market is extremely dull.

#### TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The report of the analysis of gas supplied to the city of Edinburgh on the 14th inst. showed that the illuminating power of that supplied by the Edinburgh Company was 27.50; Edinburgh and Leith Company, 28.0.

A meeting of the Committee of Management of the Forfar Gas Corporation was held last Thursday, when the subject of insuring the works was under consideration. From a report which was submitted, it appeared that of the eight towns that had been communicated with, four of the gas-works, were not insured; in the case of the other four, the subject was either under consideration, or the works were partly insured. The Committee resolved to consider the propriety of insuring the offices at the works. Regarding the proposed adoption of the Sales of Gas Act, it



appeared that in the same eight places, seven had not adopted it, and one had been working under it since the year 1860. It was resolved not to adopt it.

In his report upon the quality of the gas supplied to the city of Glasgow during the week which ended the 18th of May, Dr. Wallace states that the minimum illuminating power ranged from 26.20 candles to 27.38 candles, the average from 26.64 candles to 28.13 candles, and the maximum from 27.05 candles to 29.01 candles. In all cases, the highest results were again shown in the western district. Very good results were also shown at the southern testing station.

The Directors of the Dunbar Gas Company have resolved to reduce the price of their gas as from the 15th inst., the reduction being from 7s. 6d. to 6s. 8d., or 10d. per 1000 cubic feet.

At the annual general meeting of the Shareholders of the Buckie Gas-light Company, Limited, which was held on Tuesday week, a dividend of 5 per cent. was declared for the past year. From the Directors report, it appeared that there had been an increase in the consumption for the year of considerably over 100,000 cubic feet, and that the price had been reduced from 10s. 10d. to 10s. per 1000 cubic feet, with the usual discount to consumers as heretofore.

The Greenock Corporation Gas Committee have resolved to erect a dwelling-house for their Manager, in proximity to their new works, at a cost of about £1400.

The Greenock Water Trust met last Tuesday, on which occasion attention was called to a communication from the Engineer, suggesting a reduction in the rates charged to parties using water for motive power during the quarter from November to February, at which season of the year there is usually a large quantity of water running to waste. It was thought that many would take advantage of the water if the rate was reduced. The communication was allowed to lie over till next meeting. From the Superintendent's report, it was shown that there was 129 days supply of water in the various reservoirs.

At a meeting of the Largs Burgh Commissioners, last Tuesday, Mr. Hadden, C.E., gave in a statement of the progress of the new water-works, from which it appeared that, although the pipes were not in a thoroughly satisfactory condition, rapid progress was being made, and certain districts, including the principal streets of the town, were ready for house connections being made. Mr. Hadden was of opinion that another week would see all the pipes in proper order. About a dozen burst pipes had been got together, with many defective plugs.

The Police Commissioners of Leven, Fifeshire, have resolved to procure an additional supply of water to the town, by constructing filtering-beds, and a tank to contain 28,000 gallons, which, together with the necessary piping, are estimated to cost about £670. The supply will be about 30 gallons per head per day for a population of 4000, and the present population of Leven is 3000.

During the fortnight preceding the 21st inst. the delivery of water into Edinburgh was at the rate of 5544.70 gallons per minute, which is equal 27.28 gallons per head per day to a population of 292,500.

The Glasgow pig iron market was again extremely depressed during the past week, and as low as 48s. 11d. per ton was taken for warrants. At the close on Thursday, however, there was some improvement, buyers offering 49s. 1d. cash, and 49s. 3d. one month.

No improvement can be reported in regard to the Glasgow coal market, and even with the great number of pits idle, there is not the demand requisite to take off the existing supplies.

**SALES OF PROVINCIAL GAS SHARES.**—On the 16th inst., eight original A shares (£10) in the Eastbourne Gas Company were sold by auction, and realized £18 5s. each, two £18 2s. 6d., and four B shares, restricted to 7½ per cent. interest, £13 10s. each. On Friday last, 50 £25 shares (paid up) in the Epsom and Ewell Gas Company were sold by auction, and realized £29 10s. each.

**SALE OF NEW RIVER SHARES.**—On Tuesday last, Messrs. Fox and Bousfield offered for sale, at the Mart, Tokenhouse Yard, 30 £100 shares, fully paid up, in the New River Company. On submitting the property, the Auctioneer stated that the income of the Company last year was £15,000 more than the previous year, and that the present income is double what it was 12 years ago. The shares offered were all readily purchased at £330 each, representing a premium of £230 per cent. Every class of shares in this Company appears to be at an enormous premium. The nominal value of the King's shares, and what are known as the Adventurers shares, was fixed by Act of Parliament in 1855, when the Company applied for power to create new shares, at £21,000, and last week one-quarter of an Adventurer's share and one-quarter and one-fifth of a King's share, were sold at prices representing £93,000 as the value of a whole share, being a premium of between 300 and 400 per cent. in little more than 20 years. On Thursday, Messrs. Chinnock, Galsworthy, and Chinnock, offered for sale by auction, at the Mart, 32 New £100 shares, fully paid up. Most of the lots were sold at £330 to £335 per share.

**GAS LIGHTING IN BARBADOES.**—His Excellency the Governor of the Windward Islands has transmitted to the House of Assembly a petition addressed to him by the resident Engineer and Manager of the Barbadoes Gas Company (Mr. R. K. Moorhouse), praying the Governor to recommend the grant of a subsidy of £3250 per annum for a period of five years, on certain conditions, to enable the Company to undertake the lighting of Bridgetown and its suburbs. The petition states that the Company were established some years since; that in 1873 they were incorporated with the exclusive privilege of erecting gas-works in Bridgetown, and that, in accordance with their special Act, they have laid out a large amount of capital in the erection of works and laying mains through nearly all the streets of the city. They already supply a number of private consumers and some of the Government departments, and have, from time to time, applied to the Vestry of St. Michael to avail themselves of the means now offered by the Company for lighting the city. The Vestry, however, consider that they have not sufficient power to justify them in entering into such a contract with the Company. Hence the appeal to the Legislature. The Company, in consideration of a grant of £3250 per annum, state that

they will undertake to supply gas for 200 lights for the city of Bridgetown, lighted 300 nights in each year; providing and fixing at their own cost all necessary pipes, posts, brackets, lamps, and other necessary fittings, and keeping in repair the same for the space of five years. They will also supply the Central Police Station, Magistrates Offices, the six minor Guard Houses in the city and suburbs, the Fire Brigade Stations, Government House and its approaches, Market Hall area, and Glendairy Prison (fitting up on the most approved style all passages, cells, entrances, &c., similar to those in England); and will supply all necessary pipes, fittings, brackets, lamps, posts, &c., and keep in repair and maintain a lighting system throughout, to the satisfaction of the Authorities. They state further that, at the expiration of the term of five years, they will inspect and put in thorough good order all the pipes, fittings, &c. (save and except the street-lamps, posts, &c.), and hand them over to the several Authorities, without any further charge. The Company submit that, if this system of lighting the city and other places is carried out, they will be able to produce gas at a much cheaper rate than they can at present, which will enable them to supply it to customers at a very low price. In support of this application by the Company, a petition, signed by nearly 300 Merchants and others in the city, has been sent to the General Assembly, urging the House to take the matter into their favourable consideration, and adopt such measures as will enable the Company to carry their scheme into effect. The Governor, in transmitting the Company's petition to the Assembly, writes: "It will be for the House to determine, considering the ways and means for the current year, how far they will be justified in accepting, as a whole or in part, the proposal thus placed before them."

## Register of New Patents.

### APPLICATIONS FOR LETTERS PATENT.

- 1953.—NEWTON, H. E., Chancery Lane, London, "Improvements in filtering apparatus." A communication. May 15, 1878.  
1963.—KING, C. W., Chester, and CLIFF, A., Liverpool, "Improvements in and appertaining to valves, and to the method of actuating and governing them, such improvements being applicable to the valves of motors and pumps, known as the three-cylinder type, and also applicable in part to other types and classes of engines and pumps." May 16, 1878.  
1997.—THE HANNOVERSCHE MASCHINENBAU ACTIENGESellschaft (vormals George Eggestorff), Linden, Prussia, "Improvements in gas-engines with two pistons." A communication. May 17, 1878.  
1998.—LAKE, W. R., Southampton Buildings, London, "Improvements in motor-engines to be driven by water or other fluid pressure." A communication. May 18, 1878.  
2003.—HADDAN, H. J., Westminster, "Improvements in apparatus for the generation and application of electricity for lighting, plating, and other purposes." A communication. May 18, 1878.

### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 4323.—PIEPER, C., Dresden, "Improvements in the apparatuses for the purification of coal gas." A communication. Nov. 19, 1877.  
4423.—GORDON, J., Glasgow, "Improvements in apparatus for controlling and regulating the supply of water and preventing waste." Nov. 24, 1877.  
4479.—AUZE, P., Toulon, France, "Improvements in the manufacture of gas and in apparatus used in its production." Nov. 28, 1877.  
464.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in valves or apparatus for reducing or regulating pressure." A communication. Feb. 5, 1878.  
755.—PEEBLES, D. B., Bonnington, N.B., "Improvements in apparatus for governing or controlling the flow or pressure of illuminating gas and other fluids, and in part relating to the testing of gas." Feb. 23, 1878.  
835.—PARETT, J. S., King's Heath, Worcester, "Improvements in pressure-gauges." March 1, 1878.  
891.—BARROW, J., Clayton, Lancs, "Improvements in manufacturing ammoniacal salts and utilizing certain waste products." March 5, 1878.

### PATENTS WHICH HAVE BECOME VOID.

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.  
1599.—JENNINGS, J. G., and Pocock, A. W., "Improvements in liquid-meters." April 30, 1875.  
1621.—HAIGE, B., "Improvements in cocks or valves." May 1, 1875.  
1625.—PAPE, T., "An improved method of and apparatus for filtering and deodorizing sewage, so as to prevent rivers being polluted thereby." May 3, 1875.  
1729.—GORDON, J., "Improvements in waste-preventing stopcocks or valves." May 10, 1875.  
1752.—HALLSWORTH, S., and BAILES, R., "Improvements in purifying illuminating coal gas, and in the preparation of the means employed therefor." May 11, 1875.

### PATENTS WHICH HAVE BECOME VOID.

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.  
1207.—LAKE, W. R., "Improvements in the construction of draught tubes or globes designed to be used as a substitute for the globes ordinarily placed on gas-burners." May 4, 1871.  
1247.—WARSOP, G., "Improvements in pipe-wrenches." May 9, 1871.

## TO GAS ENGINEERS.

### D. BRUCE PEEBLES & CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

**TAY WORKS, BONNINGTON, EDINBURGH.**



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## TO SUBSCRIBERS.

In consequence of the Whitsun Holidays, the next Number of the JOURNAL OF GAS LIGHTING will not be published until Wednesday, June 12.

## THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 4, 1878.

### Circular to Gas Companies.

A CORRESPONDENT in another column calls attention to the provisions of a Bill now awaiting second reading in the House of Lords, entitled "An Act to consolidate, with amendments, in one Act, the provisions of the Gas-Works Clauses Acts, 1847 and 1871," so far as they affect testings for pressure. The two general Acts above mentioned contain no clauses providing for pressure-tests; but in most of the special Acts passed within the last two or three years, clauses have been introduced exactly like the 33rd and 34th clauses of the Bill now referred to. Clause 33 imposes upon undertakers the obligation to provide a testing-station, in which, among other things, the pressure at which the gas is sent out shall be recorded. So far, so good. If the Company send out gas equal to the required pressure, that should be quite sufficient; but from a variety of circumstances, over which the Company have but little or no control, pressure will vary, and consumers will complain. Supposing such complaint to be made, the Bill now under consideration, and the special Acts to which we have alluded, confer on a legally-appointed Gas Examiner the right, after giving two hours notice to the Company, "to open any street under the control or management of any Local Authority or Road Authority" between certain hours, in order to ascertain the pressure of the gas in the main as near as possible to the service-pipe of the complaining consumer; but the hours during which these tests may be made deserve to be noticed. They are the hours of maximum consumption—that is to say, from "five o'clock to ten o'clock from October to March, and from eight o'clock to eleven o'clock from April to September." It follows that the Act gives no power to test the pressure of the gas in the mains between midnight and sunset. There may be no great grievance in this at present; but as gas comes into more general use for cooking and heating

purposes, it may be found necessary to make the day pressure equal to the night. We often hear complaints by those who use gas-cooking stoves, and have even heard of hundreds of dinners being spoilt for want of sufficient gas to properly cook them. Our correspondent points out other defects in the Consolidation Bill. When a legally-appointed Examiner has dug down to the main, has he any right to drill a hole in the pipe? And supposing he has, who is the party to pay the expense of opening and reinstating the street? The Bill does not make this at all clear; and, as it now stands, a consumer would undoubtedly hesitate before he himself took proceedings, or set a Local Board in motion. The Consolidation Bill we notice is no credit to those who drew it. Two or three things in it require to be made clear before the Bill can become law. Our own opinion we have given above. The pressure registered as the gas leaves the works must be taken as the pressure at which the gas is supplied.

The arrangements are now all complete for the Exhibition of Gas Apparatus by the Corporation of Birmingham, which is to be opened on the 5th inst., and continued until the 11th. The judges who have been appointed are Mr. C. Hunt, Mr. H. Hack, Gas Engineers in the employment of the Corporation; Mr. Wood, Superintendent of Fittings Department; Mr. F. W. Hartley, and Mr. H. Gore, of London; and, specially for cooking apparatus, a *chef de cuisine*, whose name has not yet been revealed. We heartily hope that the Exhibition will prove a success, and that not only the Corporation of Birmingham will profit, but that the consumers from all surrounding districts who visit the show will carry back to their homes the conviction that, at all events at this time of the year, the use of gas for culinary purposes will prove extremely economical.

We alluded, in our "Circular," last week, to a letter of Mr. Newbigging, in which he detailed experiments which conclusively showed the temperature of gas at the top of an ascension-pipe. A second letter, which arrived too late to be referred to, gave an account of further experiments made to ascertain the heat of the gas in the ascension-pipe at a short distance from the retort. These were of an extremely interesting character, and tend to prove that the high heats observed by Mr. Paterson were caused by tarry matter—naturally at an elevated temperature—which deposited itself upon the bulbs of the thermometers. We regard these experiments as of great value and importance; but the matter should not rest here. We hope further investigations will be made, and the question soon set entirely at rest.

Another matter which certainly requires investigation is the relative values of the Wright, the Letheby, and the Referees apparatus for determining the amount of sulphur in gas. No one would think of detracting from the value of the late Mr. Wright's inventions, including that for the estimation of sulphur; but we think we may say, with truth, that in every one's hands but those of Mr. Pattinson, that apparatus has failed to show more than an approximation to the true amount of sulphur contained in gas. The late Dr. Letheby gave it an exhaustive trial in comparison with the apparatus he himself devised. Mr. Pattinson's comparative experiments, as detailed in the letter which we publish to-day, are somewhat inconclusive. All we can say is, that whether the Wright, the Letheby, or the Referees apparatus be employed, the amount of sulphur found depends, to a great extent, upon the will and skill of the operator.

There is a strong agitation in Bradford to secure a reduction in the price of gas, it being believed by the consumers that keeping gas at a high price in order to aid the rates is simply robbing Peter to pay Paul. We are glad to see consumers under Corporations adopting this view. As a correspondent expressed it some time ago, "every tub should be made to stand upon its own bottom." A gas undertaking should be self-supporting. According to John Stuart Mill's principle, it would be quite as proper to levy a high police rate to cover the losses of a gas undertaking as to charge a high price for gas in order to pay for public improvements.

Dickens's Mr. Toots was not an original creation. The author must often have met with him in the journalistic world with which he was so intimately acquainted. The editor who writes letters to himself is by no means a scarce character; but the Toots of the press does not make use of great names; he makes a grievance of his own, and ventilates it as opportunity offers. Thus, as regards our own speciality, we have often found in provincial papers letters from "An Aggrieved Gas Consumer," "Dim Lights," &c., all bearing the plainest evidence that style and phraseology can convey, that they emanated from the same head—we do not say brain. The exigencies of journalism sometimes, perhaps, necessitate a resort to an artifice of this kind; but, even when sorely pressed for matter to fill a column, the journalistic Toots might be fair, and, at the same time, abstain from showing his ignorance about the matter of which he is



writing. If gas blackens the ceiling, it is, as we have often said, a simple sign that the consumer is burning good gas with a bad burner. If his furniture be "spoiled," and his "gilt cornices" be made dingy, he has only himself to blame, for it is ten chances to one that gas has nothing to do with the damage. If, for instance, a complaint was made in Swansea that the gas injured textile fabrics and gilt framings, the answer would be that the gas contains an average of only eight and a half grains of sulphur in one hundred cubic feet, and no one who knows anything about the matter would believe that, with efficient ventilation, any damage would be done by such an amount. Seriously, it is quite time that this stupid squabble at Swansea should cease. It is mainly a personal matter, in which the large majority of the ratepayers of the borough take no interest whatever. The Corporation might possibly purchase the gas undertaking at its proper price; but the town is now so overlaid with debt that we have strong doubts whether the Urban Sanitary Authority could raise sufficient money for the purpose. The very few in the Council who advocate the purchase, do so with a hope that, by plundering the gas consumers, they might be able to relieve some of the rates of which the inhabitants now so bitterly complain. The negotiations must, however, be begun and carried on in a businesslike and proper manner. Incessant abuse, which, after a time becomes ridiculous, will do no good whatever.

The meeting of the British Association of Gas Managers, which will open at the rooms of the Society of Arts, London, on the 18th inst., under the Presidency of Mr. Corbet Woodall, Engineer of the Phoenix Gas Company, promises to be one of unusual interest. The list of communications to be read, which appears in our advertisement columns, contains some which ought to give rise to valuable discussions, and we almost fear that too much work has been cut out for the fragments of the two days which can be given to the reading of papers and the debates thereon. The Committee will, of course, exercise their discretion as to the papers to which prominence shall be given. We do not here put them in the order in which they appear in the programme, but take the liberty of pointing out which, in our opinion, are most worthy of attention. Every one in the list deserves serious consideration, but so much time is necessarily taken up with the formal business of the Association, and so little is, therefore, left for the discussion of scientific and practical matters, that a certain number of communications will have to be "taken as read." We, therefore, suggest the papers which, in our humble opinion, relate to subjects on which the experience of the Members will be very valuable. The prevention of waste in gas-works is a most important matter, and few in the profession are, perhaps, as capable of dealing with it as Mr. Hunt, of Birmingham. Waste prevented means profits increased, and the only standard employers recognize in the excellence of a Manager is the amount of profit he can make. A new standard for determining the illuminating power of gas is undoubtedly desirable. We believe in candles, but shall be happy to accept any other standard which can be considered as reliable in scientific truth, and as significant in expression. The causes tending to retard the application of gas to heating purposes, whatever they may be, well deserve attention. We are always looking forward to the day when gas will be largely used for other than illuminating purposes. We wish, in the interest of Gas Companies, to see the day consumption equal that of the night, and, for this reason, shall be glad to hear what, in Mr. Travers's opinion, prevents this desirable end, and also any suggestions tending to the removal of the obstacles. We cannot hear too much about the application of ammoniacal liquor as a purifying agent. The expression now is axiomatic, that the products of the distillation of coal furnish all the means for purifying gas; but the matter has not yet been worked out to a satisfactory conclusion. Every experiment, however, which tends to elucidate the matter ought to command the serious notice of Gas Managers. Differences of opinion exist as to the methods which should be employed in the analysis and valuation of residual products. There are sellers and buyers, and it can hardly be expected that the two will agree as to the money value of a residual product until a process is devised which will give incontestable results. A correct method therefor is a desideratum. The purification of gas by liquids; the construction of retort-settings; brick, concrete, and composite tanks; cooking apparatus; and improvements in carbonizing apparatus, are amongst the other subjects upon which papers are promised at the forthcoming meeting. The transfer of gas-works, to be brought forward by Mr. A. Penny, is, to Shareholders, a most important business; so is the relation of capital to revenue, which will be treated of by Mr. G. Livesey. These latter subjects, though

perhaps not specially concerning the functions of Gas Managers, are of the greatest general interest, and we shall be happy to learn what two such experienced authorities have to say on these matters. The lecture by Mr. Wills is to be on "The Products of Combustion," and the excursions this year will form interesting features in the proceedings, of which we trust as many Managers as possible will avail themselves. The day following the business meetings will be devoted to an inspection of the largest gasholder in the world, now in course of construction at the works of the Phoenix Gas Company, in Kennington Oval, and subsequently an excursion to Bushey Park and the works of the Grand Junction Water Company, at Hampton. On Friday, June 21, the Members are to start for a trip to Paris, where the Société Technique have made arrangements to afford our countrymen a most cordial reception and the means of a most agreeable and instructive visit.

### Water and Sanitary Notes.

The Standing Orders Committee of the House of Lords have declined to suspend the Standing Orders in the case of the Manchester Corporation Water Bill. The Thirlmere scheme is, therefore, shelved for the year, and we do not think its prospects are improved for another session. It seems strange that, amended by a Select Committee of the House of Commons, it should be held not to comply with Standing Orders, when the provisions indicating non-compliance have been inserted by the other House. It would have been perfectly competent for the Lords to have rejected a Bill on its merits, but they have chosen to avail themselves of a merely technical point. The Bill will, of course, be brought forward next year, and will, no doubt, receive the sanction of the Commons; but with apparently a strong opposition in the Lords, its ultimate fate must be considered uncertain. Perhaps, however, when the measure is fully considered, the wants of Manchester and the neighbourhood made plain to their lordships, and the advantages which may be derived by towns along the line of aqueduct on the execution of the scheme appreciated, the Bill may be allowed to become law.

The Bill of the Southport Water-Works Company, which passed the Commons unopposed, had in the Lords to encounter the opposition of the Corporation of the borough. Why the Corporation did not oppose in the House of Commons must be a mystery to every one but themselves. In the Lords they attempted to force auction clauses on the Company, but the Committee declined to insert them. It would seem that the dividends paid by the Company have varied considerably in amount, and as there was really no prospect of any considerable premiums being realized at public sales of shares, the auction clauses are just as well left out of the Bill. We may, at the same time, congratulate the Shareholders of the Company upon the decision, and we think we may also congratulate the inhabitants on the fact that the water undertaking is now likely to remain in the hands of the Company for a very long time. They have served Southport excellently well, and now, in extending their limits, they will confer a great blessing on additional communities. It may be regretted that the Lords reduced the amount of capital asked for by the Company, because £200,000 was not a large sum when the probable future wants of Southport and the neighbourhood are considered, and it is very undesirable to compel Companies often to go to Parliament.

Earl Redesdale has taken upon himself to obtain the re-committal of the Bill of the Durham Water-Works Company, in order to give the Corporation and the Urban Sanitary Authority the opportunity of opposing the measure. How it could happen that the Town Council did not become alive to the obnoxiousness of the Bill before it was introduced to Parliament we cannot imagine, and we think a body so culpably negligent of what they consider the interests of their constituents, deserve but little consideration at the hands of the Legislature. They now propose to hold a town meeting, in conformity with the Borough Funds Act, and, if supported by the ratepayers, will offer strong opposition to the Bill before the second Committee. It may be admitted that the water of the Wear is not the purest in the kingdom, and that it is not greatly improved by filtration; at the same time it would be difficult to show that the inhabitants of Durham have suffered from drinking the water. They have a fair average death-rate, and, so far as we know, epidemic disease is not more common in Durham than in cities more fortunately situated as to water supply. The somewhat unusual step taken by Lord Redesdale will considerably delay the progress of the Bill. The town meeting is convened for the 12th inst., and his lordship has promised to postpone the sitting of the Committee, so that the opposition may be fully heard.



## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

## TAR, AND THE ABSORPTION OF THE ILLUMINANTS IN COAL GAS.

SIR,—I observe in the last JOURNAL that Mr. W. White, of Abersychan, claims to be first to have drawn the attention of Gas Engineers to the action of the dip in depriving the gas of some of its richer illuminants.

Whilst giving full credit to Mr. White for doing good service, by his pamphlet, in calling attention to this important matter (providing, at the same time, by means of his valve, a substitute for the dip), I cannot recognize the justice of the claim he puts forth.

The question, however, of priority in directing attention to the subject is of greatly less moment than the subject itself, which is one well deserving the thoughtful consideration of Gas Managers. It is principally with a view to ventilating the question that I write the present letter.

A simple gas is usually described to be a permanently elastic fluid, under the ordinary conditions of temperature and pressure. Coal gas, which is compound in character, does not answer to that description. When it has been distilled from the coal by the agency of heat, and issues from the retort up the ascension-pipe into the hydraulic main, there is carried in suspension, along with the permanently gaseous fluids, a number of hydrocarbon and other vapours, which condense at temperatures varying from about 160° or 140° Fahr. downwards.

These hydrocarbons contribute largely to the illuminating power of the gas, and it is, of course, desirable to retain them in the permanently gaseous form. Some of these hydrocarbons, especially such as are of the greatest density, are reduced to the liquid state by the mere mechanical reduction of their temperature; whilst others of them of equal specific gravity, and many of those of lower density, undergo a change from the gaseous to the liquid condition, by reason of the solvent or absorbent action of the liquid contents of the hydraulic main, through which, by reason of the dip, they have to pass; or with which, in the absence of dip, they come intimately in contact. The former may be classed as hydrocarbon vapours, the latter as gaseous hydrocarbons. It is thus evident that the process of condensation commences at the hydraulic main, the results there produced materially affecting the quality of the gas.

Those hydrocarbons that are changed to the liquid form by this slight diminution of temperature, it is probably impossible to retain in the gas, under any circumstances whatsoever. With the more volatile, though still heavy, hydrocarbons, the case is different; the power of retaining them in the permanently gaseous form is within the bounds of possibility, and these are, therefore, of the greatest interest to the gas manufacturer.

A further class of hydrocarbons are not liquefied at all under ordinary conditions, and there should never be any difficulty experienced in keeping them in the gaseous state. I forbear here to do more than merely refer to the fact, well known to Chemists and Gas Engineers, that the whole of the illuminants of the gas can be eliminated by the employment of certain means, and, indeed, they occasionally are, by the neglect of ordinary precautions.

Of the second class of hydrocarbons—viz., those which, though of high specific gravity, it is practicable to retain in the gaseous form, I shall now speak. Their retention in the gas, and how this is the most likely to be accomplished—or at least how best to remove all impediments to that end—greatly concerns the gas maker. I have assumed that the mere reduction of temperature between the retort mouth and the hydraulic main will not affect their gaseous condition. Under what other circumstances, then, are they condensed in the hydraulic main, and in the subsequent mains leading to the condenser? The answer is clear, and is what I have already indicated—viz., by the affinity which exists between them and the already liquefied hydrocarbons present in the mains.

Some remarkable notes, corroborating these views in several important particulars, are recorded by Mr. W. Young, being the result of a number of experiments made by the late Mr. Cusiter, in 1868, on the absorption of the light-giving constituents of coal gas by the heavy hydrocarbon oils, his attention being drawn thereto when experimenting with glycerine as a substitute for water in gas-meters.\*

After having satisfied himself that the disadvantages attending its use were not compensated by its advantages, he turned his attention to other liquids which might, he thought, be suitably applied for the like purpose. One of these was mineral oil of 840° specific gravity. The effect of this with 28-candle gas was to reduce the illuminating power to 14 candles; and with gas of 35 candles, to 16·1. During the winter of 1873-4 he repeated the experiments, and made some additions to the number. These included paraffin spirit of 768° specific gravity, the distillate of crude paraffin oil of 810° and 860° specific gravity, and blue oil of 895°, all at the temperature of 60° Fahr. In each case the action of the fluids on the illuminating power of the gas was appreciable, but was greater with the denser oils. On passing the 28-candle gas through the paraffin spirit of 760° specific gravity, at a temperature of 60° Fahr., the result was nil; when the temperature was reduced to 50° Fahr., the loss in illuminating power was 5 per cent.; and when the temperature was raised to 70° Fahr., there was a gain of 7 per cent. On the other hand, by passing the gas through either of the heavy oils, the loss of light amounted to 65 per cent.; and on agitating the gas and the oil together, the light-giving constituents were almost entirely removed—the gas, after treatment, consisting of light carburetted hydrogen, hydrogen, and carbonic oxide. Mr. Young deduced from these experiments various facts of great interest, having reference to the means thus afforded of ascertaining the per centage of hydrocarbons in a given quality of gas, but these are foreign to the present subject.

In a further paper on the same subject,† accompanied by experiments, Mr. Young showed that so great is the solvent action of heavy

hydrocarbon oil (boiling point 180° Fahr.), that hydrocarbons, such as olefiant gas, which are permanent gases at ordinary temperatures, may be reduced to the liquid form in passing through it. He further showed that if, instead of allowing the gas and mixed hydrocarbons to cool together, the gas, saturated with the vapour of the lighter hydrocarbon liberated by heat from the mixed fluids, were transfused into a separate vessel, thereby preventing the heavier hydrocarbon from coming in contact with, and reabsorbing the lighter, the gas would remain saturated with the vapour from the more volatile fluid.

These important facts lead to but one conclusion—viz., that the practice so largely pursued and recommended, of allowing the whole of the tar to flow along with the gas through an extensive range of pipes to the condenser, both being gradually cooled together in the passage, is founded on an erroneous estimate of the results that follow thereon, is highly objectionable, and must be condemned.

Mr. R. H. Patterson, with that wise insight which characterizes his investigations, recently gave expression to his views on this subject in an able article,\* in which the fallacy of the prevailing opinions with regard to the practice of keeping the gas in contact with the tar is very clearly shown.

The cooling of the gas gradually is a provision the wisdom of which is unquestionable, and the plan of causing it to make the circuit of the retort-house in pipes is probably the best method of accomplishing that object; but the deposited tar in the hydraulic main and in the foul main at the point, as near as can be ascertained, where its temperature has fallen to about 110° or 100° Fahr.—the temperature at which its absorbent powers come into most active operation—should be drained away direct to the tar-well by its own separate conductor.

The chief advantages hitherto believed to accrue from the lengthened contact of the gas with the tar are—first, the absorption by the latter of naphthaline that would otherwise be carried forward to be deposited, by reason of the decrease in temperature, in the mains on the works, and even in the street-mains, service-pipes, and the internal fittings on the premises of consumers; and, secondly, the absorption also of a considerable portion of the obnoxious sulphur and other compounds.

These advantages will not be forfeited by the direct removal of the bulk of the tar, because sufficient will be left in the circuitous gas-main to absorb any excess of naphthaline vapour present, and even to assimilate a portion of the sulphur impurities. Besides this, as the general effect will be to leave a larger proportion of the gaseous hydrocarbons in the gas, these, by virtue of the power which they possess in common with the liquid hydrocarbons, of assimilating—and, in this special case, of suspending—other hydrocarbons, will necessarily assist in retaining in the permanent form a portion of the naphthaline that would, in presence of the greater bulk of tar, have been liquefied and deposited. By a similar train of reasoning, the fact of the inferior quality of the tar produced from the richer cannels, as compared with that from coal, may be explained.

In dealing with this subject, it has been assumed by some that no absorbent action is likely to result so long as the tar with which the gas is in contact is at a temperature of about 100° Fahr. and above, and that, therefore, the dip in the hydraulic main causes no diminution in the amount of hydrocarbon gases present. It has even been assumed that the tar in the main gives off a proportion of hydrocarbon vapour, and in this way increases the illuminating power of the gas. On reflection, however, it will be plain that this argument is altogether untenable, for it is scarcely possible to conceive that hydrocarbons which have already been liquefied at a high temperature can again, at a lower temperature, assume the gaseous or vaporous form. There can be no doubt that the tar has an absorbent action, less or more, at all temperatures, being greatest at the lowest, and this being so, the dip must have a prejudicial effect upon the illuminating constituents of the gas.

5, Norfolk Street, Manchester, May 29, 1878.

THOS. NEWBIGGING.

## THE INFLUENCE OF WASHING ON ILLUMINATING POWER.

SIR,—The following remarks are prompted by your editorial notes in your issue of the 21st inst. You seem inclined to think that gas in which all the light naphthas are taken up (and not, as at present, only a portion of them, the remainder being in the tars) will not stand the necessary washing. From experiment and practice, I am convinced that such gas will not only stand washing, as well as gas made in the ordinary way, but will withstand cold, and keep as well as ordinary gas. My reasons for thinking so are derived from a number of experiments, confirmed by actual working at Hamilton, Glasgow, &c.

Seeing that the great portion of the illuminants in gas are naphthas, and are of the same character as those left at present in the tars, there is no reason why the naphthas in the gas should not have been left in the tars, and the naphthas in the tars passed away with the gas—in other words, that the naphthas should change places, or, if desired, the tar could be made to rob the gas of nearly all its naphthas, or, as I advocate, the gas should carry all the naphthas from the tars. Rich gases up to 30 candles, which contain large amounts of naphthas, withstand any amount of washing at ordinary temperatures, and I can see no reason why poor gases, deficient in naphthas, should not stand washing equally well if enriched by a little extra naphtha.

In working the Aitken and Young process at Hamilton, the gas was washed in the usual manner, and it did not suffer more than ordinary gas. At the Corporation works, Dalmarnock, Glasgow, the gas was washed with a steam jet, and did not suffer by washing more than ordinary gas does. During last winter, when using the process at these works, the temperature of the gas leaving the condenser was for days from 33° to 35° Fahr., and the illuminating power never fell below 30 candles. The coal used was Provanhall, which in actual working yielded as under:—

	Gas made per Ton of Coal.	Illuminating Power.	Sperm per Ton of Coal.
Patent process . . .	9464 feet	30·4 candles	975 lbs.
Ordinary process . .	9053 "	26·28 "	816 "
Increase in sperm value by patent process, 19·5 per cent.			

As you are aware, the gases made at Hamilton by the old and new processes were tested by a Sub-Committee of the West of Scotland

\* Proceedings, West of Scotland Association of Gas Managers, October, 1874. (See JOURNAL, Vol. XLIV., p. 571.)

† Proceedings, West of Scotland Association of Gas Managers, April, 1875. (See JOURNAL, Vol. XLV., p. 893.)

\* "On Keeping Gas in Contact with Tar." (See Engineering, Vol. XXII., p. 438.)



Association of Gas Managers, who reported an increase in sperm value by the new process of over 20 per cent.

I think it is beyond question that the gas made by the patent process will not only stand washing as well as gas made in the ordinary way, but will also withstand cold as well, and keep without deteriorating more than ordinary gas, provided always that the gases are of equal illuminating power.

As regards the permanency of the gas, I have to state that, at Dalmarnock gas-works, gas made by the patent process was kept in a holder for seven days, and during nearly all that time a keen frost prevailed. The gas when put into the holder was somewhat over 30 candles, and when tested at the end of the week it was found to have lost about 5 per cent. of its illuminating power. This loss, I think you will agree with me, is not greater than what 30-candle gas, made by the ordinary process, would have lost under the same circumstances.

All the particulars published about this process have been results got from working with second-class cannels, or with third-class cannels and shales; but experiments have been made which prove that a greater gain per cent. is got from working the process with common coals, the increase being in these trials from three to four candles.

HENRY AITKEN.

Darroch, near Falkirk, May 29, 1878.

#### GAS-TESTING AT NEWCASTLE-ON-TYNE.

SIR,—In reply to Mr. George Livesey's letter in your JOURNAL of last week, I have to say that Wright's sulphur-testing apparatus is used by me in testing the gas at Newcastle-on-Tyne. There is no reason why this should not be stated in the reports I make to the Town Council, and I will see that it is done in future. The reason I continue to use this apparatus is simply because it was the apparatus in use in Newcastle-on-Tyne when the limit of 17 grains of sulphur per 100 cubic feet of gas was fixed by the Newcastle and Gateshead Gas Company's Act of Parliament; and I should think it as unfair to the Gas Company to use an apparatus which shows a higher amount of sulphur, as I should think it unfair to the public were I to use a standard illuminating power test which gives a higher result than the Sugg-Letheby burner, also in use when the Act was obtained, and which is still used here.

Mr. Livesey appears to think that the apparatus I employ shows only about one-third the amount of the sulphur that is shown by the London Gas Referees sulphur-testing apparatus when testing the same gas. In this he is very much mistaken, as, I think, I shall be able to show. Some time ago I had occasion to compare the results obtained in testing the same gas with the London Gas Referees apparatus, the Letheby apparatus, and Wright's apparatus. The three tests were all going on together in the same room at the same time, so that there can be no doubt the same quality of gas was burnt in each apparatus. Each test was continued over 24 hours. The following figures show the number of grains of sulphur per 100 cubic feet of gas obtained by the various tests:—

	Wright's	Gas Referees.	Letheby's.
No. 1 . . . . .	18.64 . . . . .	19.77 . . . . .	Not used.
" 2 . . . . .	13.69 . . . . .	15.13 . . . . .	10.66
" 3 . . . . .	11.42 . . . . .	12.77 . . . . .	8.68
" 4 . . . . .	8.77 . . . . .	9.81 . . . . .	7.16

It will be seen that the sulphur indicated by the Gas Referees apparatus in no case exceeds the sulphur indicated by Wright's by more than  $1\frac{1}{2}$  grains per 100 cubic feet. I confess I was somewhat astonished at these results, for, knowing as I did that Wright's apparatus had been discarded in some places in favour of the Letheby apparatus, I was not prepared to find that the sulphur arrested by the former was greater than in the Letheby apparatus. It is but fair to state that the Letheby cylinder used was one of the older and larger kind—about 7 inches in diameter—which would not give such high results as the smaller cylinder more recently adopted.

That Wright's apparatus, when properly used, gives results which agree very nearly with those given by the Gas Referees test receives indirect corroboration also from this fact: I was present when Dr. Pole tested the Newcastle gas for sulphur by Mr. Vernon Harcourt's colour test. The test made indicated 3 grains of sulphur, which, on being added as usual to the hypothetical 7 grains—supposed to exist in the gas, in a form not indicated by the test, in order to assimilate it to the Gas Referees test—makes 10 grains. My test by Wright's apparatus, taken at the same time, indicated 9.5 grains of sulphur per 100 cubic feet.

I think I am justified by the above experiments in coming to the conclusion that the Newcastle sulphur tests may be very nearly converted into Gas Referees sulphur tests by adding  $1\frac{1}{2}$  grains to the former.

I have had abundant proof that Wright's apparatus will indicate a large quantity of sulphur in the gas, if a large quantity be present; for when any irregularity takes place in the works in the changing of purifiers, or in the action of the scrubbers, the amount of sulphur has sometimes risen to about 30 grains, and even between 40 and 50 grains per 100 cubic feet of gas. In recovering from these accidents, the sulphur gradually decreases again, test after test, until the normal quantity of from 7 to 9 grains is again reached.

Mr. G. Livesey had the opportunity of knowing of the above comparative figures some time ago, for I gave them in evidence before the House of Commons Committee on the Crystal Palace Gas Company's Bill of last year, when, if I mistake not, this gentleman was present. Instead of attempting to throw discredit upon the tests of Newcastle gas, by sneering and by making vague assertions, it would have been much more to the purpose if he had attempted to show, by experiments, that the relation between the two sulphur tests is different from what I then pointed out.

75, The Side, Newcastle-on-Tyne, May 30, 1878. JOHN PATTINSON.

#### STEPHAN'S GASES FROM SEWAGE, ETC.

SIR,—The notice in your JOURNAL of the 28th ult. has been pointed out to me; and, as you appear to have somewhat misunderstood my processes, I should be glad if you would give me the opportunity of replying, in your next issue, to the queries which you have put.

You were wrong in placing foremost in your notice the manufacture of the oxyhydrogen gas. This should have come after that of the carburetted hydrogen gas, of which it is a result, and has yet to be fully demonstrated by me in practice before its working can be thoroughly understood. I am able to do all which my patent embraces, and this will be shown in due time, but for the present I prefer to treat of the carburetted hydrogen light, which has been already seen by a large number of scientific gentlemen (including the Birmingham Gas Engineers to whom you refer), and the public generally, and the details of which are now becoming pretty well understood. I shall be very happy if you can favour me with space to give a description, in an early paper, of the oxyhydrogen process; and, as far as the limits of a letter will allow, explain the uses I propose to put it to. I am aware of the explosive character of the gas, under certain well-known conditions, but such is rendered impossible under my system.

I will take your objections to my method of manufacturing the carburetted hydrogen gas in the order in which they appear in your notice:—

1. You say I "must have exhibited something which gave a good light—a light that could not be obtained by any treatment of sewage deposit." And you hint that, in place of sewage, I must have employed "lumps of chalk saturated with petroleum, coal, coal dust, and even creosote." I can only give a direct negative to these assumptions. The lights I have displayed have been produced from either bones or sewage and limestone only, and the residuals have been, in the retort, building lime and calcined bone (worth double the price of green bones, and finding a ready market), and, in the condenser, ammoniacal liquor, pitch, tar, and grease. It must be obvious that, where water, limestone, and bone are used, two of these articles, when done with for gas-making purposes, are more than doubly valuable than in the raw state; and, in the case of sewage, where an article costs nothing, and is, in fact, a nuisance, there is found to be remaining, after it has yielded an abundant supply of gas, similar valuable residuals to those described in the bone process, how can it be doubted for a moment that what I offer to the public, and which need not be prejudicial to gas companies, whose works and mains are equally available for my system as for coal gas, is of very great value, and most opportune at the present time? Of the permanent character of both gases I am certain, from a long course of experiments, having had them in the holder over 100 hours, without any perceptible loss of illuminating power. I shall be happy at any time to prove in practice to your self, or any of your subscribers, the truth of these statements.

2. You say, "A burnt sewage deposit would leave nothing but some carbonaceous dust," &c. This is an error on your part, and you could not have carefully read the particulars of my process. I do not burn, but *boil* the sewage, and it is only the subsiding pitchy matter from the boiler, after the steam has been converted into gas, which I use in the front of the retort for carburetting the hydrogen.

3. You say, "Lumps of chalk saturated with petroleum, when heated, become mere lumps of chalk again." This is wrong. Chalk by burning is converted into lime.

4. You say, "Bones when burned give off some foul oil, which is useless," &c. You must be little aware of the result of bone calcination, or you would not have made such an assertion. Bone gives off, under a low red heat, an extraordinary volume of olefiant gas, which being taken up by hydrogen will give a light of high brilliancy—to speak within the mark, of 30-candle power and upwards.

As to the other remarks in your notice, I am quite content to believe that your opinion as to facts and motives will be very much modified when you become better acquainted with my processes and their great utility.

JOHN A. STEPHAN.

Derby Villa, Rainbow Hill, Worcester, June 1, 1878.

[We, of course, gladly allow Mr. Stephan to state his own case in his own way, but we have nothing to alter in reference to the remarks we made upon his process last week. If Mr. Stephan can teach us how to make, at a cheap rate, a highly luminiferous gas, and at the same time furnish valuable residuals, we shall willingly give due publicity to his method.—Ed. J. G. L.]

#### THE USE OF WATER AS A MOTIVE POWER.

SIR,—In your reprint, in the JOURNAL of the 21st ult., of my paper on water power, I find that all references to the "Duncan" water-meter have been altered to "Deacon" water-meter. This may cause some confusion, and I therefore beg to explain to you that the Duncan meter (of which I enclose a sketch) is an entirely different instrument from the "Differentiating Waste Water-Meter," patented by Mr. Deacon. The latter is not, and cannot be, used for purposes of power. It is used to record automatically, on a diagram, the volume of water flowing through distributing mains at every moment throughout the day.

Municipal Offices, Liverpool, June 1, 1878.

J. PARRY.

[In reading proofs of the paper, it was thought by our Sub-editor that the word "Duncan" was a misprint for "Deacon." We apologize to Mr. Parry for the error, and will give a description of Mr. Duncan's water-meter in an early number.—Ed. J. G. L.]

#### HOW IS THE PRESSURE OF GAS TO BE TESTED?

SIR,—Will you permit me to point out one or two curiosities in the proposed Gas-Works Clauses Act, which seem hitherto to have escaped notice? We have, for the first time, an attempt to prescribe something definite on testing for pressure, but what is the result.

In clause 17 we have the old story of what the pressure is to be from sunset to midnight, and from midnight to sunset "at the main, as near as may be to the junction therewith of the service-pipe supplying such consumer." As far as I know, no one ever knew how this was to be ascertained; but, by a very wide interpretation, it might mean that the pressure should be taken on the consumer's premises, as near as may be to the main from which he is supplied, all gas on the premises being extinguished, and due allowance made for the height of the point where the testing takes place above the main; but in clause 33 we find that the apparatus for testing pressure is to be in the testing-place provided by the undertakers, as, if the pressure were to be then tested without any reference to its position. When, however, we come to clause 34, we



find these words (after prescribing that the Gas Examiner may test illuminating power and purity on any day between 5 and 10 p.m. in winter, and 8 and 11 p.m. in summer), "and may also on any day, between the hours aforesaid, test the pressure at which the gas is supplied at such other places as he may think fit, giving two hours previous notice to the undertakers of the time and place at which such testing will be conducted, and may, for the purpose of such testing, open any street under the control or management of any Local Authority or Road Authority."

No provision is made for who is to bear the expense of opening the street; nor, as far as I can see, when the street is open, has the Gas Examiner any power to interfere with the Company's main so as to put on his pressure-gauge. Is this all included in the power to open the street? Supposing, however, that these difficulties are got over, the words, "between the hours aforesaid," preclude any possibility of testing between midnight and sunset, so that part of clause 17 prescribing the pressure during that period is a dead letter, while the obligation to give two hours notice to the Company would effectually ensure the pressure being in accordance with the Act when the testing was made, even if it had not been so previously. Fancy the absurdity of a Gas Examiner going with a squad of paviors and gas-fitters to open the main for the purpose of testing the pressure near the junction of the service of a complaining consumer, who, in all probability, is suffering (if from anything at all) from some defect in his own fittings! Will the said consumer pay for the job, or are Local Authorities expected to do so?

CHAS. HEISCH.

City Gas Examiner's Office, 79, Mark Lane, E.C., May 31, 1878.

#### THE TEMPERATURE OF GAS IN ASCENSION-PIPES.

SIR,—I was led, by the interesting letter of Mr. R. O. Paterson, to give some little attention to this question. From the reply of Mr. Newbigging, it would appear that the high temperature registered by Mr. Paterson was due to some error on his part. To test the truth or otherwise of this, I examined a few of our ascension-pipes, with the following results, being careful to insulate the thermometer from the heat of the stand-pipe. The retort was charged with  $2\frac{1}{2}$  cwt. of Wigan Arley coal, six-hour charges:—

	1st Hour.	2nd Hour.	3rd Hour.	4th Hour.	5th Hour.
3 feet above the mouthpiece.	202°	200°	200°	198°	200°
Middle of pipe . . . . .	134°	134°	122°	110°	104°
Top of pipe . . . . .	74°	72°	70°	70°	70°

Temperature of second retort, charged at 1.15 p.m., under same conditions as above:—

	At 1.20 p.m.,	At 2.15 p.m.,	At 3.15 p.m.,	At 4.15 p.m.,	At 5.15 p.m.,	At 6.15 p.m.,
	Higher than	Higher than	Higher than	Higher than	Higher than	Higher than
3 feet above the mouthpiece	640°	640°	640°	640°	640°	600°
Middle of pipe . . . . .	640°	504°	509°	520°	520°	480°
Top of pipe . . . . .	200°	200°	198°	198°	198°	169°

Same retort two days after, under same conditions as above, charged at 1.15 p.m., the temperature was:—

	At 1.20 p.m.,	At 2.15 p.m.,	At 3.15 p.m.,	At 4.15 p.m.,	At 5.15 p.m.,	At 6.15 p.m.,
	Higher than	Higher than	Higher than	Higher than	Higher than	Higher than
3 feet above the mouthpiece	320°	640°	640°	640°	380°	380°
Middle of pipe . . . . .	210°	360°	378°	380°	220°	196°
Top of pipe . . . . .	160°	199°	200°	199°	120°	115°

Being desirous of ascertaining what these high temperatures were due to, I succeeded in extracting some of the volatile matter, to ascertain its temperature during volatilization, which I found to be nearly 700° Fahr.

I do not see the question at all in the light that Mr. Newbigging does. I do not believe the gas has these high temperatures at all; but they are due to the tarry and volatile matter. If the gas was prevented from expanding, of course it would be as hot as the tarry matter; but, as the action of the exhauster entirely prevents this, by allowing free room for expansion, all the heat poured into the gas becomes latent, and is not registered by the thermometer at all.

I may just say that I believe Mr. Paterson was perfectly right in what he said about the high temperature he found in the retort-house, as my experiments bear him out. With regard to the difference of temperature registered in my experiments, I may add that the one showing the lowest was about the average of the whole retort-house—about 1800° Fahr., while the one registering so high was, as near as I can make out, about 2400° Fahr. It is quite evident that the temperature of the issuing volatile matter will differ in all retort-houses where different heats are used, and also in all retort-houses where the same heats are used, but different qualities of coal—that is to say, coals giving off varying quantities of moisture and volatile matter.

T. A. COLLINGE, Analyst to the Corporation.

Rochdale, May 31, 1878.

[If anything were wanting to show the necessity for accurate observation, which we have always insisted upon, in all stages of the distillation of coal, and the temperature of products as they issue from the retort, it will be found in our Correspondent's letter.—Ed. J. G. L.]

#### AIR AS FUEL.

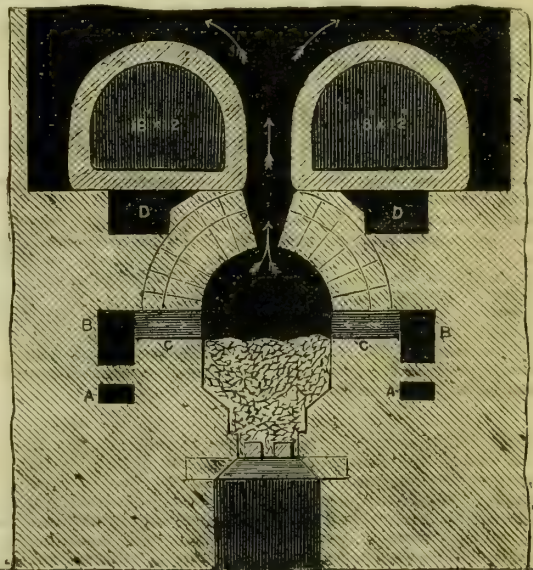
SIR,—In the description given by Messrs. Wilson and Douglas of their new furnace, I recognize a very, very old face. In 1847, I made a set of drawings for the late Mr. George Lowe of a retort setting and furnace, which he called his "Blow-Pipe Furnace." Its object was to utilize more effectually the carbonic oxide generated by the vapour passing through the incandescent coke, which was ignited above the solid fuel by the aid of air vents, or nostrils, left in the side walls of the furnace. When I was at the Chartered Gas Company's works in Horseferry Road, and had charge of the retort-houses, I found the same principle had been at work there for some years. It was, I believe, originally designed by the late Mr. Evans, sen. (father of Mr. F. J. Evans), and the only difference in the arrangement between the furnaces of Mr. Evans and Mr. Lowe was that Mr. Evans used a deep furnace, the full width at bottom, and gradually diminishing at top to about 4 inches, while in Mr. Lowe's furnace the side walls were vertical to the springing

of the arch, and the nostrils, or vents for the escape of the heat, were oblong holes left in the crown of the arch. The main principle, however, was the same, that of furnishing oxygen to the gaseous compounds above the coke. It is quite a misnomer to call it an air fuel furnace; it is the carbon in the carbonic oxide which is the fuel, and the air is the cause of it burning. I enclose you a rough pen and ink sketch of the working drawing I used at Leeds in 1853, where I constructed some 50 or 60 furnaces on this plan. You will see by the sketch how the air vents were applied, the cold air being drawn in through the lower channels.

I firmly believe, when we go back to the principle of making "light," instead of coke, tar, and ammonia, and are content to use the heat generated in our furnaces for its legitimate purpose, that of evolving the gaseous constituents of the coal, then such an arrangement of furnace will be acceptable to gas makers; but the present notion seems to be to make the most of the residuals and leave the gas to take care of itself.

42, Pentonville Road, London, N., May 28, 1878.

HENRY GORE.



A.A. Air channels communicating with the outside air.

B.B. Air channels with air heated.

C.C. Slits or vents, 1 inch wide and  $2\frac{1}{2}$  inches deep, to convey heated air into furnace.

D.D. Exhaust flues.

DEATH OF MR. W. H. WHIFFIN.—With unfeigned regret we announce the death, on the 30th ult., of Mr. William Harding Whiffin, Secretary of the West Middlesex Water-Works Company. Mr. Whiffin's health had been failing for some time, and he died at his residence, No. 12, Sandringham Gardens, Ealing, on Thursday last, of heart disease, aged 74. He had been in the service of the West Middlesex Company for the long period of 47 years, during nearly 25 of which he held the office of Chief Clerk and Secretary, having been appointed to succeed the late Mr. Knight at Christmas, 1853. He was most able and zealous in the discharge of his duties, was much esteemed by the Board of Directors, and was held in the highest respect by all who knew him.

SEWAGE OF HERTFORD.—The Corporation of Hertford have placed their works for the purification of the sewage of that town in the hands of the Rivers Purification Association, who, for an annual subsidy of £350, undertake the whole management of the place, similarly to what they have done at Coventry, which place has been successfully worked for some time by the Rivers Purification Association under a subsidy from the Corporation of Coventry. Hertford is situated on the River Lea, from whence the New River Company derive their supply. The average daily flow of sewage amounts to about 1,640,000 gallons, the population being 7169. Water-closets are in general use, and the sewage, which is very dilute, in consequence of leakage of subsoil waters into the sewers, also contains refuse from breweries. By an Act passed in 1854 the New River Company obtained powers to lay down intercepting main sewers through the town, to construct works for treating the sewage by the lime process, and to convey the effluent water past the New River head into the Lea above the town of Ware. These sewage and outlet works cost the New River Company £28,000, and they pay the Corporation of Hertford £600 a year to purify the sewage. For 16 years, from 1858 until 1875, the lime process was used to purify the sewage at a working cost of £410 a year, and was then given up, as the Phosphate Sewage Company took a lease of the sewage works.

THE SAN PAULO GAS COMPANY, LIMITED.—At the meeting of Shareholders on the 14th ult., at the London offices of the Company, Pinners Hall, Great Winchester Street—Mr. Delmar in the chair—the Directors reported that from the 1st of July to Dec. 31, 1877, the total receipts for public and private lighting and rental of meters were £8591 8s. 6d., being an increase over the first six months of the year of £754 13s. 9d., thus showing a continually increasing revenue, which would have been even more favourable but for the low rate of exchange in Brazil. The net amount of revenue carried to credit of profit and loss account for the half year was £3014 8s. 6d., which added to the amount brought forward (£1212 3s. 8d.) after payment of the last dividend in October (£2148 12s.), made a total of £4226 12s. 2d. available for dividends and contingencies, out of which the Directors recommended a dividend to be paid for the six months up to Dec. 31, 1877, at the rate of 8 per cent. per annum, free of income-tax, amounting to £2864 16s., carrying forward the balance to credit of profit and loss, £1361 16s. 2d. The Directors state that the banking account of Mauá and Co. is yet unsettled, but as the three years delay granted by the Brazilian Government for the liquidation of the bank expired in May, the Board have every right to expect payment about that time. No further orders have been issued by the Government for the extension of public lighting, but a general desire of the inhabitants for this object is forcibly urged by the public journals of San Paulo, so it is inferred that this extension will soon be made. The private lighting is progressively extending. Mr. Gill, the Engineer of the works, reports that the machinery and buildings are in perfect order and repair, and the works are going on most satisfactorily.



## Parliamentary Intelligence.

## HOUSE OF LORDS.

MONDAY, MAY 27.

The following Bills received the Royal Assent:—Lea Bridge District Gas; Lewes Gas; Marseke and Saltburn Gas; Nottingham Water; Scarborough Water; Truro Water; York United Gas.

The Chairman of Committees informed the House that the opposition to the Cardiff Water Bill was withdrawn.

The Examiners reported that no further Standing Orders are applicable to the Cardiff Water Bill, Weston-super-Mare Improvement Commissioners Bill, and Radcliffe and Pilkington Gas Bill.

Southport Water Bill,—reported from the Select Committee, with amendments.

Gas and Water Orders Confirmation Bill, Local Government Provisional Orders (Droitwich, &c.) Bill,—brought from the Commons, read the first time, and referred to the Examiners.

Bradford Water and Improvement Bill, Newbury Borough Extension Bill,—read a second time, and committed.

East Grinstead Gas and Water Bill, Hemel Hempstead District Gas Bill,—read the third time, with the amendments, and passed.

Manchester Corporation Water Bill.—A petition, in favour of dispensing with the Standing Orders not complied with in respect to this Bill, was presented from the Local Board of Hyde.

TUESDAY, MAY 28.

Bangor Local Board Bill,—reported.

Cheltenham Corporation Water Bill,—brought from the Commons, read the first time, and referred to the Examiners.

Burton-upon-Trent Commissioners Bill.—Commons amendments considered, and agreed to.

Tredeggar Water and Gas Bill,—read the third time, and passed.

Bradford Water and Improvement Bill,—referred to a Select Committee, consisting of Earl Devon (Chairman), Lord de Ros, Lord Lyttelton, Lord Clements, and Lord Gormanston; to meet on Friday, May 31.

Manchester Corporation Water Bill.—Petitions in respect to this Bill were presented, in favour of dispensing with the Standing Orders not complied with, from (1) Corporation of Oldham, (2) Local Board of Walton-le-Dale, (3) Trustees of the late Duke of Bridgewater, and of the late Earl of Ellesmere; and, in favour of, and praying to be heard against alterations, from Local Board of Walton-le-Dale.

## PUBLIC HEALTH ACT (1875) AMENDMENT BILL.

The Earl of KIMBERLEY, in moving the second reading of this Bill, which has passed the Commons, said that the object of it was to enable Rural Sanitary Authorities to provide or require provision of a sufficient water supply. Where it appeared to the Rural Sanitary Authority that any house, within their district, had not such supply within a reasonable distance, and they were of opinion that such supply could be provided at a reasonable cost, not exceeding a capital sum, the interest on which, at 5 per cent. per annum, would amount to 2d. per week, or at such other cost as the Local Government Board might determine to be reasonable, they might call on the owner of the house to provide it, and, in case of his non-compliance, provide it themselves, and charge the expense to him. The Bill further provided that, in the case of all houses built after its passing, the Local Sanitary Authorities should have the power of withholding a certificate if there was not a sufficient water supply, and the effect would be to prevent the uncertificated house from being used as a habitation. He intended, in Committee, to propose an amendment extending the appeal given by the Bill to owners of existing houses against whom orders were made, to owners of houses to whom the Rural Sanitary Authorities refused certificates, and there would also be an appeal to Quarter Sessions against the decision of the Sanitary Authorities. The Bill only extended to water supply the principle embodied in existing Sanitary Acts with reference to the prevention of nuisances and overcrowding.

The Duke of RICHMOND and GORDON, while approving of the Bill generally, said he wished to guard himself against being supposed to agree in all its details. He thought that it would require amendment at the hands of a Select Committee, as there were points connected with the area of taxation which would have to be considered.

The Marquis of SALISBURY thought that some unexpected results might follow from imprudent legislation upon this subject; and, indeed, in some districts cottages might have to be pulled down. He knew a village which was upon the top of a hill, with some hundreds of feet of clay under it. The inhabitants had now to go some short distance to fetch water; but if the matter were placed in the hands of a fanciful Sanitary Authority, the result might be a considerable destruction of cottages. In many rural districts a water supply for cottage use was to be obtained only in one or other of two ways—either by sending to a distance for it, or by storing rain water. In the latter case cisterns must be erected, and this would make a considerable addition to the expense of cottages, which at present often cost a good deal more than could be derived from them. In many parts of the country there was a strong prejudice against the use of rain water for domestic purposes. It might be well, therefore, to have a declaration in the Bill that rain water was wholesome.

Earl FORTESCUE approved of the object of the Bill, which was that wholesome water should be brought within reasonable reach. A good deal of water might, however, be fit for various household purposes that was not fit for cooking or drinking, so that the terms of the Bill would require careful consideration in Committee. With proper amendment he believed the Act would be a useful one.

The Earl of KIMBERLEY said that there was this safeguard, that the Act was only to be brought into operation where it was practicable at a reasonable cost.

The Bill was then read a second time, and committed.

FRIDAY, MAY 31

The Examiners reported that the Standing Order applicable to the Gas and Water Orders Confirmation Bill, and the Local Government Provisional Orders (Droitwich, &c.) Bill has been complied with.

The following report from the Standing Orders Committee was agreed to:—That the Standing Orders not complied with in respect of the Manchester Corporation Water Bill ought not to be dispensed with.

Limerick Corporation Gas Bill.—Report from the Select Committee read, that the Committee had not proceeded with the consideration of the Bill, the opposition thereto having been withdrawn.

Hamilton Burgh Bill,—reported with amendments.

Cardiff Water Bill, Weston-super-Mare Improvement Commissioners Bill,—read a second time and committed.

Nottingham Improvement (Gas, &c.) Bill, Southport Water Bill,—read the third time, with the amendments, and passed.

Bournemouth Gas and Water Bill, Grand Junction Water Bill,—brought from the Commons, read the first time, and referred to the Examiners.

Bedlington Local Board Water Bill.—Commons amendment considered and agreed to.

Durham Water Bill.—The Chairman of Committees reported to the House that he was of opinion that this Bill should be proceeded with as an opposed Bill (under Standing Order No. 95), and that any parties who may petition on or before Friday, the 7th day of June next, to be heard against the Bill, should have leave to be heard by the Committee appointed to consider the Bill. This was agreed to, and the order made on the 9th of April was discharged, and the Bill referred to a Select Committee.

Radcliffe and Pilkington Gas Bill.—A petition against this Bill was presented from the Local Boards of Little Lever, Prestwich, Radcliffe, and Whitefield.

Manchester Corporation Water Bill.—The following petitions in respect to this Bill were presented:—In favour of dispensing with Standing Orders, from the Corporations of Wigan and Warrington, and the Local Boards of Tyldesley with Shakerley, Hindley, West Houghton, Atherton, Adlington, and Leigh; in favour of, and against alteration in, from the Corporation of Warrington, and the Local Boards of Adlington, West Houghton, and Leigh; and against, from Ratepayers of Manchester.

Public Health Act (1875) Amendment Bill.—The Earl de la Warr gave notice that, on the motion for the House to resolve itself into a Committee on this Bill, he will move that it be referred to a Select Committee.

## HOUSE OF COMMONS.

MONDAY, MAY 27.

The Examiners reported that the Standing Orders not previously inquired into have been complied with in the case of the South Staffordshire Water Bill (Lords).

Dalton-in-Furness Local Board Bill, West Houghton Local Board Bill, South Hants Water Bill.—Lords amendments agreed to.

Burton-upon-Trent Commissioners Bill (Lords),—read the third time, and passed, with amendments.

Grand Junction Water Bill,—as amended, considered.

Leicester Corporation Bill (Lords), Lichfield Gas Bill (Lords),—read a second time, and committed.

Metropolis Water Supply Bill.—The order (Jan. 30) that the Metropolis Water Supply Bill be committed, was read and discharged, and the Bill withdrawn.

TUESDAY, MAY 28.

The Examiners reported that the Standing Orders not previously inquired into have been complied with in the case of the Exeter Corporation Water Bill (Lords).

Cockermouth and Workington Water Bill.—Lords amendments agreed to. Cheltenham Corporation Water Bill,—read the third time, and passed.

Clitheroe Gas, Water, and Improvement Bill (Lords),—read the third time, and passed, with amendments.

Bournemouth Gas and Water Bill,—as amended, considered.

Newry Gas Bill (Lords),—read a second time, and committed.

WEDNESDAY, MAY 29.

Bedlington Local Board Water Bill (Lords),—read the third time, and passed, with an amendment.

Mansfield Commissioners Gas Bill (Lords),—read the first time, and referred to the Examiners.

THURSDAY, MAY 30.

Scarborough Corporation Water Bill.—Lords amendments agreed to.

Grand Junction Water Bill,—read the third time, and passed.

Drumcondra, Clonliffe, and Glasnevin Township Bill,—as amended, considered.

Public Health (Ireland) Bill,—considered in Committee of the whole House, reported, and recommitted.

FRIDAY, MAY 31.

East Grinstead Gas and Water Bill, Hemel Hempstead District Gas Bill.—Lords amendments agreed to.

Bournemouth Gas and Water Bill,—read the third time, and passed.

## HOUSE OF COMMONS COMMITTEES.

FRIDAY, MAY 17.

(Before Sir JOSEPH BAILEY, Chairman; Mr. CHAMBERLAIN, Mr. MACIVER, and Mr. BLAKE; Sir JOHN DUCKWORTH, Referee.)

## GRAND JUNCTION WATER BILL.

Sir EDMUND BECKETT, Q.C., and Mr. JOHN CLERK, Q.C., appeared for the Promoters; Mr. CRIPPS, Q.C., Mr. MICHAEL, Q.C., and Mr. O'HARA for the Metropolitan Board of Works, petitioners against the Bill.

Sir E. BECKETT, in stating the case for the promoters, said the Bill was a very simple one, and, in fact, there was no substantial opposition to the preamble, as the petition of the Metropolitan Board would be more satisfactorily dealt with on clauses. The object of the Bill was to enable the Company to raise further money, and to amend in certain respects their existing Acts. The preamble recited that, "Whereas by the Act of 1861 it was enacted that the limits within which the Company might supply water were by that Act extended so as to comprise the following parishes or places in addition to the Company's then district—i.e., Chiswick, Acton, Isleworth, Twickenham, Hampton, Teddington, Hampton Court, Hampton Wick, Bushey Park, Whiston, and Hanworth, all in the county of Middlesex, provided that those limits should not comprise certain parts therein specified of the parishes of Isleworth and Ealing. And whereas it is expedient that the Company's limits of supply be extended so as to include the whole of the said parishes of Isleworth and Ealing, and the parishes of Hanwell and Heston, in the county of Middlesex." The corresponding clause in the Bill which extended the limits was the 4th, which provided that the whole of these parishes should be included. A certain amount of explanation might be given on this point. When the Bill of 1861 was in Parliament, there had been passed, only a year before, an Act authorizing the Colne Water Company to supply water to the district excepted, and it was alleged at that time, on behalf of the Colne Company, that the Grand Junction Company had not been active enough in extending their supply, the Grand Junction Company made excuses for not having done so, and it was submitted to Parliament that, if there was to be any security for the work being done, they should pass the Bill of the Colne Company, who would come into existence and carry out the obligation, or do it by arrangement with the Grand Junction Company. As the result of the passing of the Bill of the former Company, the second of the two courses was taken; the Colne Company made arrangements with the Grand Junction Company, who, no doubt, had *bona fide* intended to do the work, but had not been quick enough. The Colne Company, in consequence, passed out of existence, having sold themselves, in some way or other, to the Grand Junction Company, as most people expected they would. However, that had not come off in 1861, and it was only natural and usual that Parliament having given parts of those parishes to the Colne Company in the previous year, should exclude them from the Grand Junction Company's Bill. The necessity for the extension of the water supply by the latter Company had now become so great, that they were at present



supplying a district which they had no Parliamentary power to supply. In parts of this district the Sanitary Authorities were shutting up the wells, because they were polluted by sewage and other impurities, which made the water unfit to drink, and it was therefore necessary that good water should be forced on the inhabitants, even if they were not asking for it. However, they were asking for it, and he could hardly imagine that the Metropolitan Board would think of opposing the Bill on that ground, whatever else they might have to say. This, and things corresponding to it, were really all in the Bill that involved matters of principle. The Company required more capital, in order to extend their works, and they asked in the Bill for power to raise £300,000. The estimate for works immediately necessary was £260,000. They were continually called upon to extend their pipes, and therefore they provided a reasonable margin beyond immediate requirements—a very small margin, £40,000—which, plus the usual borrowing powers, would probably last them for 10 or 15 years. The necessity for the Bill was shown by the fact that Major Bolton, the Government Inspector, had recommended that certain works should be done by the Company, for preserving the purity of their water. In his report for the month of April, he said: "The construction by the Grand Junction Company of further impounding reservoirs, for subsidence at the intake at Hampton (so as to avoid the flood waters) is in contemplation, as the Company will require such reservoirs before they can deliver effectually filtered water during the period when floods prevail. The filter-beds require thoroughly cleansing and reconstructing, and the area thereof extending." These things would have to be done, and as land was expensive, the estimate for the purpose was not unreasonable. Major Bolton, in a further marginal note to his report, said: "Additional impounding and subsiding reservoirs are much required, to avoid taking in water when floods prevail. Daily samples were taken, and the water generally found to be clear and bright. The filter-beds require to be thoroughly cleansed, reconstructed, and extended." Upon that point there could be no doubt at all. The only thing, therefore, upon which it was necessary to trouble the Committee was the petition of the Metropolitan Board, which related to other topics than the real necessity for the Bill. The first paragraph of the petition that was of any consequence was the 4th, in which the Board said: "By the Bill it is proposed, amongst other things, to extend the limits within which the Company may supply water, and to authorize the Company to raise share capital to the amount of £300,000, in addition to the amount which they are authorized to raise by their existing Acts, and to borrow £75,000. Your petitioners object to the provisions proposed to be enacted by the said Bill, inasmuch as they submit that if the same were to pass into law they would be injuriously affected thereby in manner hereinafter set forth." When he (Sir E. Beckett) read that allegation, he tried to remember a single instance in which objections to the extension of the limits of a water company had been successful, and he could not remember one, because Parliament had always seen that companies ought to be in a condition to supply their districts with water. The Metropolitan Board then said "that the supply of water within the Metropolis by the Company at the present time is unsatisfactory." If so, that was rather a reason for passing the Bill. But in what way was it unsatisfactory? They said "as regards quantity, quality, and pressure." If so, would not the additional means of supplying a greater quantity of pure water, free from contamination, benefit the Metropolis in this respect? But the Board were wrong, for Major Bolton, in the report just referred to, said the water was excellent. No doubt the petition of the Board was presented by way of helping forward a couple of great schemes the Board had been promoting this year, and by the bringing in of which they were beginning to acquire, he was happy to see, an unpopularity they had long deserved. He (Sir E. Beckett) had had the luck to be always against them, and he knew perfectly well why this paragraph had been put into their petition. But the necessity for it no longer existed, because the Board had formally dropped one of their own Water Bills, and had substantially dropped the other.

Mr. REES (Parliamentary Agent): They have given notice to drop the other.

Sir E. BECKETT said the petition of the Board then stated that, "having regard to these facts, the Company should not be authorized to extend their limits of supply; or, if so authorized, that they should, by the Act giving them such authority (which they are not by the said Bill), be made subject to stringent and adequate provisions, having for their object to secure to the inhabitants of the Metropolis, residing within the limits of the Company's supply, a proper and sufficient supply of pure and wholesome water, for drinking and culinary purposes, constantly laid on, and also a sufficient supply of water constantly laid on at high pressure for the extinguishing of fires." The Board seemed to forget, or expected the Committee to forget, the great inquiry of 1871 into the water supply of the Metropolis, presided over by the present Speaker, when all these matters were overhauled most thoroughly. Then they said, "Your petitioners view with concern any extension of the Company's limits of supply, and submit that such extension will be prejudicial to the health and property of the inhabitants of the Metropolis now supplied by the Company, inasmuch as it will impose further duties and obligations on the Company, and thus render the Company even less able than they are at present to supply the wants of such inhabitants." Then they objected to any increase in the capital of the Company. How the limits were to be extended and the work done, which the Government Inspector said ought to be done, without an increase of capital, he was at a loss to know. But that which followed in the petition was, he supposed, the gist of the case. The Board "submit that, even if such additional capital be authorized, the same should not be raised as proposed by the said Bill, unless provision is made therein for the sale by auction, in the open market, of the shares or stock, by the issue of which such additional capital is proposed to be raised, and for the application towards the general purposes of the Company of any bonus or premiums that might be obtained by the sale of such shares or stock in manner aforesaid, and also for regulating the issue of such shares or stock, and making the same contingent upon the exercise of the borrowing powers contained in the said Bill." "They submit that it would be unjust not to make such provisions as aforesaid, as to the sale by auction of the new shares or stock of the Company, and the application of any premium or bonus thereon, and the regulation of the issue of such shares and stock as aforesaid; and they object to the said Bill, as, by reason of the absence therefrom of such provisions as aforesaid, any moneys obtained by way of bonus or premium on new additional share capital issued under the powers in the said Bill contained, would be paid over to the Shareholders of the Company, instead of being expended for the benefit of the Water Consumers." Then the petition proceeded to crave attention to the report of the Fire Brigade Committee of last session, in which, among other matters, that Committee recommended, "That the water supply now belonging to the various Companies should be consolidated in the hands of a Public Authority, which, in dealing with the question of constant supply, pressure, and pipeage, should be bound to have regard, not only to the wants of customers, but also to the requirements for the extinction of fires." But, after all, the main point of the petition was the prayer for the introduction of auction clauses into the Bill. Now, there was but little to be said about

them. Parliament last year took occasion to consider the question of auction clauses, as regarded Gas Bills, and, for some reason of their own, they came to the conclusion that Gas Bills ought to have provisions of this kind introduced into them, unless the Committees to whom such Bills were referred should come to the conclusion that, for particular reasons, they should not be so inserted. The result was the adoption of a Standing Order for introducing into Gas Bills two things—first, a sliding scale of price and dividend—a thing invented by some Board of Trade conjuror; and, secondly, auction clauses. He (Sir E. Beckett) was not now discussing a Gas Bill, and therefore would not say anything about the operation of these clauses; but he might say this, that the consequence of the meddling of the Metropolitan Board with the London Gas Companies ever since 1860 had been to impose upon the inhabitants of the Metropolis a burden which might be reckoned at at least a million a year, because it had resulted, in an indirect way, in nearly all the capital of the Companies being raised at a 10 per cent. dividend, instead of at a 7 per cent. dividend.

Mr. CRIPPS objected that this matter was irrelevant, and that it was undesirable to refer to it.

The CHAIRMAN said that Mr. Cripps would have the opportunity of making a speech afterwards.

Sir E. BECKETT said, in reference to the Standing Order of last session, that Parliament, having the question of Gas Bills before them, and, of course, having in mind Water Bills also, thought proper, for their own reasons, to adopt these Orders in respect to Gas Bills, but not in respect of Water Bills. He was bound to assume that the Committee who framed the Standing Orders had good reason for this omission. There had never been such an Order in existence applicable to Water Bills, and there was no such practice in the matter; and inasmuch as the sliding scale did not apply to Water Bills (water being always charged for by rating), and inasmuch as the sliding scale could not be imported into a Water Bill, the auction clauses ought not to be. As to precedents for auction clauses in Water Bills, there were not many, and he could easily go through them. In 1854, the Nottingham Water Company were advised by some conjuror to propose to Parliament that they should sell their shares by auction, and there were people at that time who believed the Company were making a great mistake by so doing. However, the conjuror thought he knew better, and it was done, and whenever Nottingham had been in Parliament ever since, they had had this thrown in their teeth, so much so that they had had to submit to it again. What was said to them was this: "You volunteered it to Parliament in 1852; what right have you to complain if it is forced upon you now?" But there were other cases in which the attempt to insert auction clauses had been unsuccessful. It was attempted in Liverpool, at Sunderland, and at Chesterfield in recent times, and it had failed in all these cases. He spoke subject to correction, but he believed he was right in saying that Nottingham was the only case of a Water Company upon whom auction clauses had been forcibly imposed, and in that case they had existed before. A curious statement had been put into his hands relating to something which happened this year. The Standing Order to which he referred was an Order of the House of Commons, and was not binding on the House of Lords; and the fact he was about to state, though it related to a Gas Bill, was not irrelevant to the case now before the Committee. The Bill of the York Gas Company came before the House of Lords this year, the dividend on the new capital proposed to be raised being limited to 5 per cent. The auction clauses were inserted, and the Bill passed the other House. But when the Bill came before the Chairman of Committees in this House, seeing the limitation of the dividend to 5 per cent., he struck out the auction clauses, so that it could not be assumed, even with the Standing Order, that the Legislature always insisted upon their adoption. He (Sir E. Beckett) had known heaps of cases where they had been asked for in both houses, and in which they had not been inserted, and, therefore, it could not be taken, even with regard to gas, in which there was additional reason for it, that it was at all a standard parliamentary doctrine that these clauses should be inserted. Much less so was it in regard to water. Indeed, it was the contrary, for he found that attempts, and pretty strong attempts, were made, in the case he had mentioned, to induce the Chairman to waive his opinion, but it was useless. In that state of things he (Sir E. Beckett) would ask why the usual practice in this instance was to be departed from, and the general law altered. In 1863, when the Companies Clauses Act was passed, there was a repetition, in the provision in respect to raising new capital, of the practice which was sanctioned and enacted in the first general Act in 1845. The 17th section of the Act of 1863 provided expressly for the apportionment of new shares *pro rata* amongst existing Shareholders at par, if the ordinary share capital at the time was at a premium; but it was not obligatory upon the Company so to apportion them, unless the amount of each such share, when so apportioned, would be at least the sum prescribed in the special Act, or, if no sum was prescribed, then at least £10. The £10, however, had been altered by long practice, and both Houses had agreed upon the limitation of 10 per cent. being reduced to 7 per cent. in well-established Companies, for obvious reasons. It was well known that old Companies in good condition could always raise their money, if they were entitled to have a dividend of 7 per cent.—in some cases they had volunteered less. The Grand Junction Company had not been paying any very large dividend, and latterly it had been reduced for a temporary reason. As to part of it there had been some mistake as to what should be charged to capital, and what to revenue, and, therefore, he did not claim the benefit of that; but, independently of this fact, the dividends had been falling, for some reason, since 1871. If they were to raise the additional capital now asked for, the dividends would again fall for a time, though, of course, they would recover themselves, and people would take that into account in buying shares. He would ask whether there was any charge of misconduct in the petition against the Company? Was there any allegation that they had been victimizing the inhabitants of the Metropolis, or doing anything they ought not to have done, so as to justify a departure in their case from the general law? If all other Companies were allowed to issue their new capital amongst existing Shareholders, why not the Grand Junction Company? There had been cases in which Companies had been behaving ill—supplying bad water for example, but nothing of the sort was alleged here, and, therefore, he would simply rely upon the invariable practice—for, with the exception of Nottingham, it was invariable—and ask the Committee, when they had heard the evidence, to allow the Company to raise the money they required on the ordinary terms. He would add that, in case the Metropolitan Board were really going to impugn the character of the water supplied by the Company, he had not only Major Bolton's report to rely upon, but also the analysis supplied by the official analyzer of the Water Companies—Dr. Tidy.

Mr. CRIPPS: You need not trouble yourself about that.

Sir E. BECKETT: That being so, I have said all that I have to say.

TUESDAY, MAY 21.

Mr. Alexander Fraser, examined by Mr. CLERK.

I am a Member of the Institution of Civil Engineers, and am Engineer to the Grand Junction Water-Works Company. I have been 18 years in



the service of the Company. The whole of the Company's supply is taken from the Thames at Hampton. Their works there cover four or five acres of land. They have no filtering-beds there. There are two small receiving reservoirs between the engines which pump the water and the river. At Campden Hill they have three covered reservoirs, capable of holding 18 million gallons of water. These are about 130 feet above Ordnance datum. There is 12 feet 6 inches difference between that and Trinity high water. The water taken at Hampton is pumped for  $\frac{7}{8}$  miles to Kew Bridge, where it is filtered. It is proposed by the Company to make considerable additions to the filtering area there. At Hampton they have 32 acres of spare land, on which it is proposed to construct impounding reservoirs, so that they will be able to take in water from the river when it is not in a condition of flood—a course which has been strongly recommended by Major Bolton. This will place them in a better condition in reference to filtration. In future, there will be additional filtering-beds provided at Hampton. The cost of the impounding reservoirs there will be about £5000 per acre. It will take several years to effect all these works. In round numbers, the cost of the additional works at Hampton will be £170,000; at Kew, about £50,000; additional engines at the two places, £20,000, which, with the usual 10 per cent. for contingencies, brings up the total to £261,000, out of the £300,000 asked for in the Bill. Additional outlay will be required in a few years. By the Act of 1861 the Company were limited, with regard to the area of their supply, in parts of the parishes of Ealing and Isleworth, a Company having been formed in the previous year for supplying that district, which, practically, they have never done. We have been supplying those places as well as Hanwell, though beyond our parliamentary limits. We do not at present supply Heston; it is supplied by wells; but applications have been made to the Company to furnish a supply, and the district has been included in the Bill. For this purpose new capital is required.

Cross-examined by Mr. CRIPPS: I believe there are parties in the new districts ready to take water from the Company, so that we shall get a small return upon our outlay at once. The building of a superior class of houses at Ealing is proceeding. The expenditure of the £261,000, I have mentioned, might be spread over from seven to ten years, though much of the work for which it is required would have to be done soon.

Re-examined by Mr. CLERK: The impounding reservoirs at Hampton would have to be constructed at once. Their cost is estimated at about £160,000, which sum would be spent within three years.

Mr. Ernest O. Coe, examined by Mr. CLERK.

I am Secretary of the Grand Junction Water Company. It is the case, as stated in the preamble of the Bill, that the capital of the Company, under the Act of 1855, was £850,000; that further sums were raised under the Act of 1868; and that further sums are required for the general purposes of the undertaking. Fresh capital is required at the present time, and more will be necessary within a few years. It is proposed by the Bill to authorize the raising of £300,000 by shares in the ordinary way, the whole of which, no doubt, will be required.

Cross-examined by Mr. CRIPPS: The whole of our capital already authorized has been called up with the exception of £23,215. The present value of the £50 shares fully paid is £80 in the market. For the last two years we have paid dividends at the rate of 5 per cent. Before then we paid 7 per cent. The fall from 7 to 5 per cent. is a temporary matter, owing to our revenue having been surcharged for expenditure which had been placed to capital account. We unquestionably are looking for a larger dividend in the future. Between 1850 and 1873 the average dividend was over 8 per cent.; it was as high as  $8\frac{1}{2}$  at one time. In 1874 it dropped to 7 per cent., and subsequently to 5 per cent., for the special reason mentioned. I think the Grand Junction Water Company may be reckoned as a 7 per cent. investment at the present time. I do not look upon the Bill as likely to be a very great advantage to the Company, because of the new district it will give them. A large portion of the work to be done will be totally unprofitable—that of the purification of the water. It will be many years before the new districts pay satisfactorily. Assuming that the issue of new capital to existing Shareholders does not have the effect of lowering the dividends, the shares of £50 each will be worth £80 when fully paid up.

The CHAIRMAN: Do I understand you are going to issue these shares at par to your own Shareholders?

Witness: That is the power which we have under the Act of Parliament—when the old capital is at a premium the new shares are to be offered to existing Shareholders *pro rata* at par.

Mr. CRIPPS: If there were no clause inserted in the Bill such as we ask for, that would be the case; the Directors are bound to allot the new shares to the old Shareholders.

The CHAIRMAN: Is there any allegation that the Company spend money unnecessarily—waste money, in fact—with a view to have a colourable reason to ask for more capital?

Mr. CRIPPS: No, there is no allegation of that kind. Here is a general temptation to persons in their position, which we will deal with presently, but I have no reason to make any special allegation against this Company.

Cross-examination continued: It would be an advantage to the existing Shareholders to have the new capital allotted to them. The Company would get £300,000, and the Shareholders, if they sold their allotments, would, at the present market prices, get £180,000 beyond that.

Re-examined by Mr. CLERK: The Companies Clauses Amendment Act, 1863, provides for this disposition of the new shares; it is no special provision for this Company. In 1872 our dividend was 8 per cent., and in that year we issued fresh capital, which, the original shares being at a premium, was allotted to the Shareholders at par.

By the COMMITTEE: The cause of the last fall in the dividend to 5 per cent. was that certain sums of money had been allocated to capital which should have been placed to the debit of revenue, and the Government Auditor requires them to be replaced, so that our revenue charges are very heavy for two years. The cause of the previous fall to 7 per cent. was the heavy expenditure for coal, and the high price of iron and other things at that time. May I be allowed to make one remark? It has been stated that the Proprietors will necessarily gain a very large profit from the issue of new shares under the regulations at present existing in the Act of Parliament. But that depends upon whether the new shares are raised without limitation of dividend. If they are raised at a lower rate of dividend the same profit will not be derived by the Proprietors. Upon a large portion of the old capital, we can pay 10 per cent., but upon £140,000 we can only pay  $\frac{7}{8}$  per cent. We have never paid our maximum dividend; we have never gone higher than  $8\frac{1}{2}$  per cent. Under the present Bill the maximum dividend on the new capital will be 7 per cent., but the Directors may determine to issue it at a lower rate, and in that case the price named will not be reached.

The CHAIRMAN: I understand that is only a hypothetical case. You do not say they do intend to raise it at a lower rate, but that they might?

Witness: They have not discussed the question how they shall raise it till they get the Act of Parliament, but I think it is a very probable case. We have raised portions of our capital hitherto upon this principle of limiting the dividend for four or five years, until the new capital is fully

earning profit, and then allowing it the same rate as the old capital is receiving.

This was the case for the promoters, and the following evidence was given for the petitioners:—

Mr. G. W. Stevenson, examined by Mr. MICHAEL.

I am a Civil Engineer, and have had great experience in all matters relating to the supply of gas and water. During the last ten years I have been much employed by the Metropolitan Board of Works with respect to gas questions falling within their jurisdiction. I have read the Bill of the promoters, and the petition of the Board, in the present case, and have made myself acquainted with the condition of the Company, both as to the district they supply and the amount of capital they have invested in their undertaking. The value of their present £50 shares is £80, in the market—i.e., at a premium of about 60 per cent. Supposing that the new capital of £300,000 proposed to be raised by this Bill had the same value in the market as the old capital, it would give a premium of £180,000 to the Shareholders, if allotted to them; but I do not suppose that it would have, as the dividend is limited to 7 per cent. If the new capital were offered for sale by auction, the public would be willing, no doubt, to invest money in it to pay them 5 per cent., and that would represent £140,000 upon the £300,000. There were a great number of Gas Companies throughout the country, even before the new Standing Order was passed, who were subject to the auction clauses. I have had experience as to how the public have estimated those shares by purchasing them in that way. The shares have always realized a considerable sum by way of premium, which premium has gone into capital without bearing dividend. I consider this has much inured to the benefit of the old Shareholders. If the Company are not paying maximum dividends, the effect of putting the premiums into capital enables the Company to get additional capital without increasing their burdens; it enables them to do a larger business, and to apply their profits from this increased business to the payment of larger dividends to existing Shareholders. Then it is obvious, looking at it in another way, that capital brought into a business, that does not carry any obligation with it—for instance, capital given to a man to put into his business—helps to insure the existing capital employed in that business—becomes, in fact, an insurance-fund. If the income of the Company goes on steadily increasing, as is the case with Water Companies, it enables a larger dividend to be earned when the maximum dividend has not been paid. If this new capital of £300,000 is sold by auction, I believe 40 per cent. would be raised by way of premium upon it, amounting to £120,000, which would go into the concern instead of into the pockets of existing Shareholders directly, and would thus hasten the time when 10 per cent. would be paid on their present investment. It is of importance to the consumers that there should be economy in the raising of capital, as under the Water-Works Clauses Act, 1847, the Company are under no obligation to reduce their water-rates till the Proprietors get 10 per cent.

Mr. MICHAEL: What is your experience of the auction clauses, as tending to economy in the expenditure of capital?

Witness: The introduction of the auction clauses, in respect to new capital, takes away from a Company any inducement to issue new capital; they will issue it only when absolutely required for capital purposes.

Mr. MICHAEL: Do you think generally that their application to Gas Companies has been beneficial?

Witness: I am sure it has.

Examination continued: At present there is a Standing Order, by which, except under circumstances which satisfy the Committee that they ought not to apply, auction clauses are inserted in every Bill for raising new capital for gas purposes. The Standing Order does not apply to Water Companies. Auction clauses have been inserted this year in the Bill of the Nottingham Water Company. They had previously been in operation in the case of that Company from 1852 up to 1874. I do not see any good reason why auction clauses should not apply to Water as well as Gas Companies. On the contrary, I think the capital of a Water Company should be raised more moderately, if possible, and expended more economically than that of a Gas Company, because water is a necessary of life and a sanitary agent, and people ought to get it as cheaply as possible, whereas they can afford to pay for gas, and can use gas or not as they please. Water Companies have advantages, too, which Gas Companies have not. They make their charge for water by a rate upon the annual value of the property supplied, and the annual value of house property in this country increases rapidly from year to year. That is specially the case in the Metropolitan area, in which a re-assessment of the value of property is made every five years. I know in this Company's district it has been very largely increased, and, in some cases, they have taken advantage of the circumstance to advance the water-rate. They might do so at any time with regard to the whole of the property. In the acquirement of their undertaking by any Sanitary Authority for public purposes, it would have to be taken commensurately with the amount of capital which has been raised, and the profit earned upon it. There is, therefore, a double reason why Local Authorities should be very watchful as to expenditure of capital by these Companies, as they will in future, if they acquire the undertakings, have to pay for the whole of the profits earned by the Companies, and this £120,000 would eventually be the sum which would come out of the pockets of the ratepayers.

Cross-examined by Mr. CLERK: The provision of the Act of 1863 with reference to the allotment of new capital to existing Shareholders is a general law, which has been very frequently repealed or amended in regard to Gas Companies. The Standing Orders now require auction clauses to be inserted, unless the Committee otherwise decide, for some special reason.

Mr. CLERK: Those auction clauses are coupled with the sliding scale, which enables Gas Companies to raise their dividend beyond the ordinary rate, supposing they reduce the price of gas below the standard?

Witness: The Standing Orders make it obligatory upon a Committee to insert the auction clauses with regard to new capital, unless they decide otherwise, and state their reason for so deciding; but the insertion of the sliding scale of dividend and price is not obligatory—it is optional. It may be that the two provisions are generally inserted concurrently; but there are notable exceptions.

Cross-examination continued: The auction clause which governed the Nottingham Water Company, in the raising of capital from 1852 to 1874, was inserted by them voluntarily. I knew that, but did not tell the Committee, as I was not asked. The Company needed capital very much, and they inserted the clause. They chose to increase their available capital by offering their shares at public auction, and applying the premiums so received to capital purposes. In 1874, when they came to Parliament for further capital, they declined to insert the clause in their Bill. It was pressed upon them by the Local Authority, but Parliament refused to insert it. They, therefore, obtained their new capital under the provisions of the Companies Clauses Act of 1863. It was stated to the Committee at the time, that the capital then asked for would last them for ten years, whereas they have had to come again this session, when only four years have passed, for more. The Corporation of Nottingham also promoted a Bill this session for the compulsory acquisition of the Water Company's undertaking, and by petition they opposed the Water Company's Bill,



and asked Parliament to insert the auction clauses in respect of the new capital. I do not know that it resulted in a compromise, but I know the Corporation Bill was thrown out, and auction clauses were inserted in the Bill of the Company.

Re-examined by Mr. MICHAEL: The decision of the Committee on the Nottingham Bills was this: "The Committee find that the preamble of the Nottingham Water Bill is proved. The Committee direct that the auction clauses shall be inserted, and that the capital shall be reduced to £100,000, with the usual borrowing powers of £25,000. The Committee also find that the preamble of the Nottingham Improvement, Gas, and Water Bill is proved, all reference to the purchase of the Nottingham Water Company being struck out." There was nothing said about a compromise, so far as I remember.

By the COMMITTEE: I look upon the effect of the auction clauses in this case as being absolutely to take away all inducement to spend money unnecessarily, and to hasten the time when the existing Shareholders will get their 10 per cent. dividend. I do not think that the effect will also be to take away the inducement to spend money unnecessarily. The pressure put upon Water Companies in the Metropolis and elsewhere by the Local Authorities is such that they must spend the necessary amount of money to obtain a good supply of water for their districts. Especially is that the case in the Metropolis, where reports are furnished to the Local Government Board every month.

Mr. CRIPPS was then heard in support of the petition of the Metropolitan Board against the Bill. He said he had no other witness that he desired to call, because, whatever his case might be, it was far better, he thought, where there was one clear decisive point, to bring the matter at once to that point, without troubling the Committee with other matters to which the Metropolitan Board of Works attached no very great importance. No doubt the Committee were aware—indeed, it was stated by Sir E. Beckett—that in the present session two Bills were introduced by the Metropolitan Board of Works, whom he now represented, which would have given them power to purchase the existing Water Companies, and thenceforward the supply to London would have been in their hands. Sir E. Beckett was right in stating that those Bills were brought in; he was wrong in stating that they were withdrawn; that was to say, they remained in the Orders of the day for a considerable time, and, though one passed the second reading, it became, after a certain time of the session, quite hopeless that they could have been got through the House of Commons in time enough to be considered by a Committee of the other House, and the consequence was they were withdrawn for the present session. But that withdrawal did not in the least degree (if anybody had seen the proceedings of the Metropolitan Board of Works they would see that this was so) alter the desire of the Metropolitan Board for what they thought was right to be done with reference to the water supply in the Metropolis; or indicate what would be attempted again in the next session in the matter. He would say just one word, before coming to the general question of the auction clauses, as to what would be the effect upon the Metropolitan Board, and the consumers whom the Board represented, of passing a Bill of this kind without those clauses being inserted. Of course, the Water Companies might hereafter have to be bought by the Metropolitan Board, and they would be bought, as all such undertakings were bought, with reference to their probable future value. Whatever they had been in the past was unimportant, except so far as it threw light upon the future value. Whatever the Shareholders of the day might have put in their pocket would be no part whatever of the consideration for the future. Now, supposing this Company were to get power by this Bill to raise new capital in the way in which they proposed to raise it—i.e., by allotment among the existing Shareholders—the money which would be raised for the benefit of the Company was £300,000, and what the Metropolitan Board would have to pay for, and to take into consideration in the future value of the Company, was, so far as the new capital was concerned, £300,000; yet, in the interval between now and the time when that could be carried out, and the Metropolitan Board of Works could be the purchasers, the present Shareholders of the Company might have put into their pockets about £180,000. He could not state the total amount very exactly; the amount could not be ascertained with any very great accuracy, because it depended upon the opinion of purchasers as to the value of the shares of the new capital; but, whatever it was, there would have been that enormous amount added, which would be a permanent charge upon the revenue for the future, and would not be in the least an advantage to those who would purchase the undertaking, but would have gone into the pockets of the old Shareholders. On the other hand, if the new Shares were to be sold in the market, supposing the Company wanted £300,000, and the market value of the shares was cent. per cent., they would issue merely £150,000, for which they would receive the full amount required, and for the future would have to pay dividends on only half that amount. If the capital was to be allotted, as asked, the full £300,000 must be issued, and at a future time, when the Metropolitan Board, as representing the consumers, became the purchasers of the undertaking, they would have to pay the difference between the amount of capital which alone need have been raised, and the sum actually issued by the Company.

The CHAIRMAN: Does the sum that you would pay depend upon the amount of capital or upon the amount of money earned?

Mr. CRIPPS said the earnings of the Company were required to pay so much dividend upon capital. If the capital was excessive, of course that was one of the charges, just as much as any other expense, on one side of the accounts; and, therefore, the clear profit at the end was so much less in consequence of the heavier charge for capital. He would now pass from the effect it would have in that particular instance, because he did not think he was entitled, the Bills promoted by the Metropolitan Board having been withdrawn for this session, to put them forward at all further than he had done. He would state the general effect of the powers to raise money in the way it was proposed to be raised by this Bill. Of course, it was known that in Companies of this kind they could not divide more than 10 per cent.; that was the old limit for some time fixed by law, and when the Company arrived at that degree of prosperity which enabled them to divide 10 per cent., everything over and above that went, not into the pockets of the Shareholders, but to reduce the price to the consumers, whether gas, or water, or whatever it was. The consumers, therefore, after 10 per cent., had all the interest in the prosperity of the Company. Up to 10 per cent. it was entirely a Shareholders question; after 10 per cent. it became the property of those whom the Company were supplying. To take the case of the Gas Companies who had been most prominent hitherto, because most prosperous, in which 10 per cent. had been easily reached, consumers might expect an almost immediate reduction of price, because the Companies were under the obligation, after dividing 10 per cent., to lessen the price—indeed, they had nothing else to do with the money. In that state of the law there was passed the Companies Clauses Act of 1863, and no doubt when it was passed, the effect it would have, in giving to existing Shareholders in a Company the allotment of new capital in proportion to their holdings, was not seen. It was an Act probably obtained by the Companies themselves; at any rate, it was a matter extremely convenient for the Companies to have it so. It was soon found, however, that it offered a great

inducement to the Companies to be extravagant. Of course, with a Company having their own superintendence and control (the consumers only being interested when the concern rose to a particular point of prosperity) it was very difficult to check all the different expenses which might be indulged in. The Shareholders had no interest, even if they received 10 per cent., in making matters more prosperous, and, therefore, if they chose to vote large sums to their Chairman, Directors, and Secretary, and all their other officers, and to conduct their business in an extravagant way, there was really nobody to interfere with them. The difficulty, therefore, was to invent something by which the Companies should have a real interest in being as economical as possible. That something had been invented in the case of Gas Companies by the sliding scale, which gave them the power of dividing more than 10 per cent. if they charged their consumers less than a certain sum; in other words, the more economically they carried on their business, the better it was for them, because they did not stop at the dead level of 10 per cent. The difficulty, as he had stated, always had been, with Water Companies, and every other kind of Company, to devise some machinery by which they could be induced to carry on their business as economically and carefully as an ordinary tradesman would do; because, of course, with a 10 per cent. limit, they had not that ordinary inducement to carry on their business carefully which every man had in his own private concern. Soon after the Act of 1863 was passed, it was seen that its effect was directly opposed to what Parliament were desiring to do with all Companies; instead of its being an inducement to them to conduct their business economically, like any other tradesman, it was a direct inducement for them to conduct it extravagantly and badly, because it was better for the existing Shareholders that it should be so. It did not require very much to show that that was so with new capital allotted to the existing Shareholders. For example, say the shares were of such a value that they realized cent. per cent. premium. The Company might have been able to go on very well, but finding their profits were increasing they would say, "Now, if we can get power to raise £500,000 more capital, it will have to be allotted among the Shareholders; and to our Shareholders that £500,000 will be worth £1,000,000, because, inasmuch as the public will give them £100 for every £50 the moment the £50 is allotted, each Shareholder can take his £50 to his broker on the Stock Exchange, and will receive back what is equivalent to £100." Now, it was obvious that this was an inducement to extravagance. When he was asked if he charged extravagance against the Grand Junction Water Company, he said he did not do so in any way, but Companies were no better than individuals in any case, and if temptation was set before them, and a scheme was in existence by which they could decidedly benefit themselves quite within the law, it was difficult to say that that inducement would not, in some way or other, have its operation. He did not mean to say that people were so corrupt that they would, for the sole purpose of raising new capital, pretend a want; but there were a hundred ways in which the thing occurred. The Secretary, or some one, suggested: "You want a new gasholder here; you want a new filter-bed; you want to build great towers here, and a water-tower there," and matters of that kind. Supposing he (Mr. Cripps) was a tradesman who felt that that outlay of capital would be a risk, he would take very good care to be informed of its necessity first of all; but if he was a Director of a Company and felt that the outlay would be, at any rate, a direct interest to him and the Shareholders whom he represented, in putting money into their pockets, he could not but think that he should not be different from the rest of the world if he did not inquire too closely into the actual necessities. He believed the Chairman or Director of a Company was Chairman or Director for the Shareholders as well as for the public, and he did not know, if he found that the thing could be done within the law, he was to look at the interests of the public and disregard the interests of the Shareholders, who trusted to him to represent them. It was quite clear, therefore, that the best thing he could do would be not to inquire too closely about the new expenditure, but go for a Bill for it, and get power to raise the necessary capital. This matter was thoroughly considered and discussed, and as soon as it was pointed out it became almost too evident to contradict at all, and the Legislature, therefore, in a great number of separate instances, sanctioned clauses being put into Bills which exempted them from the operation of the Act of 1863, and directed that the new capital should not be raised by being allotted to the Shareholders, but by auction. A great many Gas Bills had been passed with the auction clauses inserted, and Mr. Michael had prepared a list of Companies in whose Bills, when they applied to Parliament, auction clauses were inserted prior to the time when there was any Standing Order on the subject. These amounted to 26.

Mr. CLERK: All were Gas Bills.

Mr. CRIPPS: Gas Bills, with the exception which he would presently refer to; so that there was no Standing Order made in the first instance with reference to Gas Bills, upon the general view of the policy of the matter; but Parliament, in a number of individual cases, inserted clauses where they thought the circumstances of the case required it; and then, after a great number had been inserted, a general Order was passed, which applied it to all future Bills. The policy of doing it, therefore, did not originate with Parliament—they merely passed the Standing Order—but in different Committees, sitting on different Bills, and in different circumstances, thinking that, in the particular case before them, it was right and proper and best that it should be done. These Bills amounted to 26 in number, so that it was quite a mistake to say that the insertion of auction clauses in Bills depended on the recent Standing Order. That Order rather arose out of Committees so frequently having thought that, in the Bills before them, it was desirable that auction clauses should be introduced. That being so, two years ago the House, after a debate, applied the principle of auction clauses to Gas Bills generally, and there was no difference in principle between the case of gas and water. Mr. Stevenson made a distinction in saying that water was a greater necessary of life than gas. He did not know there was much in that; they were both necessities, but the reason why it was applied in the case of gas so generally was that Gas Companies were usually more prosperous than Water Companies, and that the dividends paid by the greater number of Water Companies were very much less upon the average than those paid by Gas Companies, and, therefore, cases had not occurred before Committees, in the case of Water Bills, so frequently as they had in the case of Gas Bills, where the circumstances rendered it desirable for the auction clauses to be inserted. Mr. Stevenson said that the result of the insertion of auction clauses, in reference to the case of gas, had been a very great boon to the consumers, and of course it would be so. First of all there was taken away from the Companies one very great inducement to be extravagant with regard to their capital, and that was the first thing that was desirable. The next was that the capital introduced into the concern was obtained at a much cheaper rate than the old capital, because if the old was paying 7, 8, or 10 per cent., or whatever it might be, and the new was raised by auction, say, at the rate of 4 per cent., of course all that cheaper capital was mixed up with the old, and assuming it to produce, when applied for the purposes of the undertaking, the same amount of revenue that the old capital did, it was obviously a very great boon to the old capital even, because it made the dividend upon it more secure than it was before,



inasmuch as the new capital introduced was a less charge upon the revenue than the old was. One member of the Committee had asked if the taking away of the power to allot new shares to the old Shareholders would not also remove all inducement to Companies going on expending money which was necessary to be expended. He might suggest an answer to that in a general way. Clearly it would not, because it was for the benefit of the old Shareholders that the concern should go on with cheaper capital than it otherwise would. Supposing he (Mr. Cripps) was dividing 8 per cent., and he wanted to continue at that rate, whether he introduced new capital upon which 10 per cent. was the charge, or capital for the same purpose at 5 per cent., was a very different thing as regarded the security of his 8 per cent. upon the old. His 8 per cent. upon the old was much more safe if a portion of the capital which earned that rate had been raised at 5 than if it had been raised at 10 per cent. Quite independently of the interest he had in getting an extra sum for the new capital if he took it into the market, the security of what he was getting for the old capital was increased. But there was another matter which was probably a still greater inducement. No Company carrying on any business desired to have another Company coming in supplying close alongside if they could do the work themselves, and it was very much better for the old Company, if they saw an opening, to appropriate it themselves, than to allow any other Company to come in whose prices might be less than theirs. In almost all Companies of this kind, there was a monopoly so long as they continued to supply consumers; but if they did not, the consumers had a right to go elsewhere, and a new Company would start. Therefore, quite independently of the benefit derived by the sale of shares on the Stock Exchange, there was quite sufficient inducement to ensure that the Company would go on with their business, and do what was required, without the necessity of allotting this money among their Shareholders. But they would only do what was required, the inducement not being sufficiently great for them to do what was extravagant and not required, though ample to induce everything to be done that would be right and proper. That being the operation of the auction clauses, he was quite surprised that Sir Edmund Beckett should so far have misunderstood them as he did in his opening speech. It was perfectly true that the capital of the Metropolitan Gas Companies was raised at 10 per cent., but the man who bought at 10 per cent. gave £200 for it, and therefore when it came to the Company it was only raised at a 5 per cent. dividend. If it were raised by the Company, it might be raised at 10 or 7 per cent., and the charge upon the business of the Company thenceforward would be a charge of so much capital at 10 or 7 per cent. If it were raised by auction, the ultimate purchaser might pay 10 per cent., but the charge upon the Company's revenue for the future was only 5 per cent.; that was to say, if sold by auction, every purchaser would give £200 for £100, and that £200 went to the Company, and as he gave £200, it was quite clear he had only to be paid 5 per cent. On the other hand, if it was allotted to the Shareholders, and he obtained 10 per cent. capital, and sold it for what he could get, the difference between the 5 per cent. and 10 per cent. went into his pockets, and was no longer heard of. Every £100 sold in that way remained a charge of £10 annually on the Company; if sold by auction, it remained a charge of £5 annually. He (Mr. Cripps) felt somewhat angry when Sir Edmund Beckett so utterly misunderstood the effect of the auction clauses and sliding scale. He was quite aware how advocacy led one away from seeing both sides of a question; but it was strange that Sir Edmund should have viewed the legislation since 1860, in reference to the gas supply of the Metropolis, as resulting in a charge to the public of an extra million a year, because it had caused all the capital of the Companies to be raised at a 10 per cent. dividend, instead of 5 per cent. It was that the £200 was raised at £10; not that the £100 was. In relation to this particular case, there was one point to be considered. If this were a Company whose shares were only selling on the Stock Exchange, and were worth very little, of course, the Bill would be unimportant; but the circumstances had to be looked to. At this moment their £50 shares were selling at £80, and the consequence was that the moment the new capital was allotted, it would bear a very considerable premium. Every Shareholder to whom it was allotted could go at once into the market, and realize some premium on his allotment. It was not, perhaps, possible to make an exact calculation of figures, because the old capital might have gone up as high as 10 per cent., and the new capital could go as high as 7 per cent. He did not know how far that might affect the selling value, because probably the holder of old £50 shares, now worth £80, did not expect to get 10 per cent. very quickly. And so upon the new capital, the purchaser would look for some increase up to 7 per cent., which, of course, would be attainable much sooner than the dividend of 10 per cent. How that calculation might work out was not material. What was material was that, whatever the figure might be, there was to those shares a very large value in the market which the Shareholders had no right whatever to appropriate. The present Shareholders went into the concern as the successors of the original holders, who ran a considerable risk in establishing a new business, and, probably, for some years had no dividend at all. The new capital was subject to no such risks; the concern was established, and it was perfectly well known what it would pay. It might be quite fair at the outset to give the Shareholders the chance of paying 10 or 7 per cent., if they could make it, but that did not apply at the present moment. It was purely a bonus which Parliament were asked to give them in respect of this new capital, that it should be appropriated amongst them. Had they given any reasons for it? They relied on the Companies Clauses Act, of 1863; but that was an Act which applied generally, and had been infringed completely in a number of individual cases, and was entirely set aside, by the Standing Orders of the House of Commons, in the case of Gas Bills. It had also been set aside this session, in the case of the Nottingham Water Bill, in which auction clauses had been imposed. This Committee were not, therefore, being asked to set a precedent for departing from the Act of 1863; it had been done over and over again in cases where Companies were in a thriving condition, showing that, in the opinion of the Legislature, they ought now to be regarding the interests of the consumers, and not looking entirely to themselves. Whatever profit the auction clauses might be to the Company, they were entitled to until they reached 10 per cent.; but, when they reached that point, these clauses would tend to the benefit of the consumers. In the first instance, seeing the Company were not now paying maximum dividends, the clauses must inure to the benefit of the Company, because, the capital being thus raised at a cheaper rate, it accelerated the time when the Company would reach their maximum dividends. On the other hand, if this new capital was to be raised by allotting the shares amongst existing Shareholders, the benefit to the Company, as such, was entirely lost. In conclusion, the learned Counsel remarked that his clients, the Metropolitan Board of Works, believed that they were on the eve of becoming the purchasers of the London Water Companies. Probably the Companies themselves did not admit that point of view, and he was quite aware that they would struggle against it, and it would have to be fought out for some weeks in an ensuing session; but the Board thought that nothing ought to be done to disturb what might be called the present prospective value of the undertakings. He thought, moreover, that it would be for the ultimate benefit of the Consumer and of Shareholder,

that whatever advantage could be derived from the introduction of auction clauses into this Bill should be secured for whoever might be entitled to it in the future.

Mr. CLERK replied. He said the question of the application of the Act of 1863, with reference to the appropriation of new capital, was not one that had a special application to the Metropolis, but affected the whole of the kingdom. If the principle was bad for London, it was bad for the Country at large. There had been, since the passing of that Act, several general Acts affecting Companies, but no attempt had been made by any one of them to amend this provision. What, then, were the special circumstances which should induce the Metropolitan Board to ask the Committee on the present Bill to depart from the general law on this matter. As a matter of fact, auction clauses had no application to Water Companies. The case of the Nottingham Company was so special that it must at once be laid aside, and not exalted into a precedent. There was no Water Act in existence, except that of Nottingham, in which such clauses existed. It had been, in years gone by, attempted to introduce them at Liverpool, Sunderland, and Chesterfield, and in each of these cases Parliament rejected them. The argument of his learned friend in favour of such legislation was that, if these clauses were not introduced in the present Bill, the Company would act imprudently in raising new capital, and would expend money unnecessarily in order that existing Shareholders might pocket the advantage which the premium attaching to the new shares would give them. Mr. Cripps did not allege that there would be an actual fraud on their part, but he alleged that they would pretend a want; that there would be inducements to extravagance. Now he (Mr. Clerk) believed that this was a most absurd proposition. The very fact that persons were in possession and management of a profitable and well-paying concern, would induce them to take care that, in the future, money should not be so expended as to produce a less return than they had made in the past; because not only would the new shares suffer by any extravagance in raising and expending money, but the old shares would be subjected to a diminution of dividend. As far as the Metropolitan Board were concerned that which they had to consider was, not what was the nominal capital of the Company so much as what were the profits of the Company, and what was the dividend they were paying. In truth, the Committee were asked to deprive the Grand Junction Company of the privilege to which, by the general law of the land, they were entitled, simply because the Metropolitan Board hoped, at some future time, to purchase the undertaking at a lower price than they otherwise could do. He (Mr. Clerk) ventured to submit that the Committee would require some more valid reason than that before they inserted a clause in this Bill, at variance with the general law of the country.

The room was then cleared, and on the parties being again admitted, The CHAIRMAN said: The Committee are of opinion that the preamble of the Bill is proved, subject to the insertion of the auction clauses. They wish for further evidence as to the amount of capital required. The amount that is proved for is £240,000, or with contingencies £264,000; the amount asked for in the Bill is £300,000, with borrowing powers of £75,000 more. The auction clauses also being inserted would raise the real value of this capital considerably beyond that sum.

Mr. CLERK: It might; it may have the effect of depreciating the value of the shares.

Mr. MICHAEL: I may say, sir, that as far as the Metropolitan Board of Works are concerned, they have no objection to the capital which is asked for on the part of the promoters; as, the auction clauses being inserted, we have a protection against the undue expenditure of capital, and we have no objection to the Company taking those powers.

Mr. CLERK: A margin is always allowed beyond immediate requirements. A few years in advance are always allowed in these cases, because you can never tell what the demands may be.

The CHAIRMAN: I think the Committee are of opinion that they are content to leave the capital as it is under those circumstances.

Mr. MICHAEL: We have prepared clauses, which experience has shown to be desirable in the working of the auction clauses, and which have been inserted in every Bill which has passed. I will hand them to my learned friend.

[They were as follows:—"Clause 8a. (New shares to be offered by auction or tender.) Notwithstanding anything in this Act contained, the Company shall, when any shares or stock created under the powers of this Act are to be issued, and before offering the same to the holder of any other shares or stock in the Company, and whether the ordinary shares or ordinary stock of the Company are or is at a premium or not, offer the same for sale by public auction or by tender, in such manner, at such times, and subject to such conditions of sale as the Company shall from time to time determine. Provided that at any such sale the reserved price put upon such shares or stock shall not be less than the nominal amount thereof, and notice of the amount of such reserved price shall be sent by the Company in a sealed letter to the Board of Trade not less than 24 hours before the day of auction, or the last day for the reception of tenders, as the case may be; and such letter may be opened after such day of auction or last day for the reception of tenders, and not sooner; and provided that no priority of tender shall be allowed to any holder of shares or stocks in the Company."

"Clause 8 b. (Purchase money of capital sold by auction to be paid within six months.) It shall be one of the conditions of any sale of shares or stock under this Act, that the whole nominal amount thereof, together with any premiums given by any purchaser at such sale, shall be paid to the Company within three months after such sale."

"Clause 8 c. (As to the notice to be given as to sale, &c., of shares.) The intention to sell any such shares or stock by auction or by tender shall be communicated to the Clerk of the Metropolitan Board of Works, and to the Secretary of the Committee of the London Stock Exchange, at least 28 days before the day of auction, or the last day for the reception of tenders, as the case may be, and notice of such intention shall be duly advertised four times during such period in two or more London daily newspapers."

"Clause 8 d. (Shares not sold by auction or tender to be offered to Shareholders.) When any shares or stock created under the powers of this Act have been offered for sale by auction or tender, and not sold, the same shall be offered, at the reserved price put upon the same respectively for the purpose of sale by auction or tender, to the holder of ordinary shares or ordinary stock in the Company, in manner provided by the Companies Clauses Act 1863. Provided always that any shares or stock so offered and not accepted within the time prescribed by the said Act shall again be offered for sale by public auction or by tender, in the manner and subject to the provisions of this Act with respect to the sale of shares and stock created under the power of this Act."

"Clause 8 e. (Application of premium arising on issue of shares or stock.) Any sum of money which shall arise from the issue of any shares or stock by way of premium, after deducting therefrom the expenses of and incident to such issue, shall not be considered as profits of the Company, but shall be expended in extending and improving the works of the Company, or in paying off money borrowed or owing on mortgage by the Company, and shall not be considered as part of the capital of the Company entitled to dividend."



Those are the clauses we propose, which are the ordinary clauses inserted in every Act.

Mr. BLAKE: Do the Metropolitan Board of Works require notice? Is there any precedent for that?

Mr. MICHAEL: It is always given to the Local Authority. We have actually followed, word for word, the precedent.

The clauses of the Bill were then proceeded with.

Sir JOHN DUCKWORTH: Is there anything to say on the question of the form of the auction clauses?

Mr. BEES: We do not criticize on the point of form. The Committee have decided the principle, and the form is the common form of clauses. The Referee will know what I mean.

The clauses were read through and settled, and the Chairman was directed to report the Bill, as amended, to the House.

THURSDAY, MARCH 21.

(Before Mr. J. HOLMES, Chairman; Mr. W. G. CARTWRIGHT, Mr. BARNE, and Mr. BOWEN; Mr. BONHAM-CARTER, Referee.)

#### NOTTINGHAM WATER BILL.

#### NOTTINGHAM IMPROVEMENT, GAS, AND WATER BILL.

(Continued from p. 837.)

Mr. Weston, a Mining Engineer of Eastwood, and a member of the deputation of the inhabitants of that place which waited upon the Directors of the Water Company in September last, deposed to the wants of the district, and the desire for the Company's service there.

Mr. William Fold, examined by Mr. POPE.

I am a Civil Engineer, and have had large experience in questions of water supply. I have frequently had occasion to investigate the water supply of Nottingham, and have lately visited the town to examine the works with a view to this application to Parliament. Formerly the water for Nottingham was obtained from the River Trent, but that supply has now been discontinued. The engines and the whole of the apparatus are there still, but they have not been used for some years. There was a general feeling in the town against the river supply, and there were better sources of supply available. The chief supply at the present time is from wells in the new red sandstone. This supply is ample in quantity and good in quality. Water is obtained from the Scottholme Springs, and brought down in a pipe to the Castle pumping-station, where it is pumped into a reservoir in Park Row, and distributed over the lower part of the town. The quantity supplied from this source during 1877 was in round numbers 70,000 gallons per diem. The capacity of these springs, as given to me by an officer of the Company, is 428,000 gallons per day. That has reference to the yield of the springs and to the power of the pumps. The Castle pumping station, supplied from the Scottholme reservoir, will give an average of 428,000 gallons. In point of fact, it distributed 70,000 gallons last year. The next source is the Park pumping-station; that is capable of yielding 720,000 gallons per diem; the quantity actually taken during 1877 was, on an average, about 280,000 gallons per diem. The water from that source is pumped into a reservoir called the Belle Vue service reservoir. The next source is Basford, where there are five engines capable of pumping 3,300,000 gallons per diem. The quantity supplied from that source in 1877 was 1,409,000 gallons per diem. Lastly, there is the service at Bestwood Park, capable of supplying 4,400,000 gallons per diem. The quantity actually supplied during 1877 was 1,310,000 gallons. The totals of these capacities are 8,848,000 gallons per diem; the actual quantity pumped during 1877, 3,069,000 gallons per diem. I omitted to say that the Basford station has the power of pumping into the Belle Vue and Mapperley reservoirs. The Bestwood station pumps into another reservoir called the Red Hill reservoir, from which the water descends by its own gravity to the Belle Vue reservoir and the Park reservoir. The supply of the town of Nottingham is divided into three zones. The Park reservoir was the first to be constructed to supply the lower zone of the town. As the population increased on a higher level, it was necessary to establish another reservoir, and this was done by forming that of Belle Vue, which supplies the middle zone. Another reservoir was established, as the town further increased, to supply the higher zone, and this was constructed at Mapperley. Therefore we have the Mapperley reservoir supplying the high zone, the Belle Vue supplying the middle zone, and the Park supplying the lower zone, the reservoirs holding in the aggregate between 5,000,000 and 6,000,000 gallons, and all covered with the exception of the Park. The reservoirs are well constructed to secure the providing of the water supply. There is constant service, and the arrangements in the town seem to be perfect. I understand that the supply is kept up without intermission. The consumption of the water, too, is as economical in the matter of management as it possibly could be. The consumption is about 20 gallons per head per diem, and one-third of this is for trade purposes, leaving about 13 or 14 gallons for domestic purposes, showing that the works are well managed. Where they are not well managed, the consumption often rises to 50 or 60 gallons per head per diem. Where the consumption is kept as low as in Nottingham, it shows careful management, and there is good service. In London the consumption is about 30 to 33 gallons per head per diem. The rates of the Nottingham Company, as compared with those in other towns, appear to be very moderate. I have not gone into the question of the proposed new works, but I have been through the district proposed to be included in the area of the Company, and from what I saw I should say that a supply of water to those places is very much needed. I should say that a Company having large supplies of water from a central point as this Company have, could supply these places more advantageously than they can supply themselves. I have had opportunities of considering the effect of the compulsory transfer of such works as these to Local Authorities, and I cannot see that there is any advantage at all. This is one of the best Companies that I know, giving the best possible supply in the best way. I cannot see where there would be any advantage in the transfer to the Corporation, or what the Corporation could do for the inhabitants that is not done at present. I think, indeed, that there is more done at present than there would be if the transfer were made, because there is a control—and a sharp one, no doubt—exercised over the Company by the Corporation.

Cross-examined by Mr. VENABLES: In the case of a transfer, the Corporation would be able to supply the public directly, but they would be under no control. In some cases, Corporations have managed water-works very well, and in others very badly indeed. It does not follow of necessity that the Corporation taking the water-works, they must necessarily manage them well. The quality of the water obtained by the Company at Scottholme is, perhaps, not so good as the others, and as the quantity is small, they might, perhaps, dispense with it. Including Scottholme, the Company have five-eighths of their supply in reserve, and five-eighths of the present pumping power is not used. I do not think the whole of this reserve could be supplied without further works, because it would exhaust the whole of the engine power, and, as everybody knows, there must be duplicate engines. Then whether the wells would hold out I cannot say. The pumping power should always be in excess of that which is wanted for supplying the water consumed. There might be a break-down, and it is necessary to be prepared for such a thing. I assume

that if the proper steps were taken, they would be enabled to supply nearly 9,000,000 gallons of water a day. Assuming that the district largely extended itself, it might be advisable to establish reservoirs in more convenient places. I can quite understand that it would be convenient, when a district largely extended, to seek a new well. I was Secretary to the Royal Commission on Water Supply, of which the Duke of Richmond was the Chairman. I drew up their report.

Mr. VENABLES: The concluding part of the report says that the duty of supplying a city with water had, from an early period, been regarded as purely a municipal function. The supersession of municipalities by joint-stock companies was a modern innovation, the New River Company being about the first formed. Since that time private companies had, to a considerable degree, exercised the functions, but of late many towns had come to the conclusion that the modern system was a fundamental error, and that water should be supplied by the municipalities themselves. I suppose if that report had to be written at the present time, you would have added several other towns to those mentioned, as having acquired control over the water supply?

Witness: Yes.

Mr. VENABLES: The report quotes the opinion of Sir Joseph Heron, Town Clerk of Manchester, and others, and says that Mr. Hawksley, Consulting Engineer of Liverpool, is not favourable to Corporations having the management of water-works, for the reason that public bodies are under external influences. It also says that legislation should restore the ancient practice, and alludes to the increasing wealth of municipalities, and the facility with which water can be supplied by them?

Witness: I should like to explain that the Commission were engaged in considering the question of the supply of water in the Metropolis by the Municipal Authorities. They were anxious to state what were the grounds on which this transfer should be made, and it is a singular fact that not one of those grounds applies to Nottingham. The Commissioners took a deal of pains to show what led them to the conclusion they arrived at. They said the system they were in favour of was the only effectual one which could be adopted for giving the Metropolis a constant supply of water. That does not apply, for a constant supply is given with the greatest efficiency at the present moment in Nottingham. Then they go on to say that there was a difficulty in supplying the poor of London with water—a difficulty of a financial character, which Companies would not have power to deal with. That does not apply to Nottingham, for I have never heard that the poor are not well supplied. If there is anything to complain of on this head, the Company are ready to meet the complaint, and provide a remedy. The report says the new system—viz., the supply of water by the Municipality, will improve the quality of the supply, but that does not apply to Nottingham, the water given there being of the finest quality. The report also says that the Local Authority could then supply water for the extinguishing of fires, but that again does not apply to Nottingham, for I am told that the water is supplied to the Corporation at considerably lower than cost price. There would be some economy, no doubt, in the Municipality borrowing the money, as they would get it at a less rate of interest than a Company. I think a Company are worthy of their hire, and that they should be allowed to make a profit. If a Company manage their works as well as the Nottingham Company have managed their affairs, and take all the risks, I do not think it is too much to pay them the fair value for their money laid out.

By Mr. STEPHENS: The Company's pipes come to the boundary of the Hucknall district, and the supply of water there would be from the Belle Vue or Red Hill reservoir. I cannot say the date when the pipes were laid up to the boundary.

Re-examined by Mr. POPE: If the Corporation have to buy at a large price on account of prospective value, they can borrow at 4 per cent. instead of 5; so that, whether they pay for it at present value or prospective value, there is not much in it. I have known a very large claim to be made for prospective values.

Mr. F. J. Branwell, C.E., examined by Mr. POPE.

I have read the petition of the Hucknall Local Board, and I have recently visited Nottingham, and examined the sources of supply. I know the provisions of the Acts of 1845, 1854, and 1874. I think Nottingham water is one of the very best supplies, perhaps the very best supply in the United Kingdom. The water is of wonderful excellence and purity. The supply is constant; any one can draw as much of it as he will, and yet there is the greatest possible precaution taken to prevent waste. These are the elements which I think go to make up a good supply of water anywhere. All the reservoirs are covered except one. To give you an idea of the purity of the water, I may say that if you open one of the doors of the reservoirs, in which there is not much light, you can see every joint in the floor of the reservoir through 8 or 9 feet of water with the greatest possible ease. I know something about the quantity of water the Company can supply per day. I do not know that the limit has been reached, but I know what has been stated to be the maximum pumping power, assuming every engine to be working day and night. Still that is no datum for supply. You must have a duplicate engine; and in the next place you do not work an engine night and day. Thus you should make a reduction on the maximum power of 40 per cent. at least. I have been told that after pumping has been going on at Bestwood for several hours the water is reduced to within about 20 feet from the bottom. That is a pretty good indication of the capacity for yield of the Bestwood well. The average consumption is put down at three million gallons a day. But you must not take average consumption; you must take consumption in dry weather, and that is four millions. Taking the pumping and wells as they are, I do not think the present supply is too much for the present district, and I do not think the Company would do wisely to take a larger district without an increased supply. The Company's charges, compared with London, are moderate, and they deal very liberally with their consumers. They supply 33,000 houses, and out of those there are absolutely only 281 which are above £70 a year in rental value, and that shows all the more to their advantage. In 1851 their gross income was £5800; in 1861, £14,800; in 1871, £20,700; and in 1877, £32,800; and I find that last year, 1877, there was an increase of £2597; and moreover, notwithstanding the depressions and fluctuations of trade, there has been a constant increase from 1871 up to the present time. For the last six years only there has been an increase of more than 50 per cent. Looking at the district, there can be no doubt that a further supply is wanted. Nottingham is well known as one of the most thriving of our towns. In the same neighbourhood there are a number of villages approaching the dimensions of small towns. It is natural and proper (and cheap) that they should take water from the Company. I do not know of any local circumstances about Hucknall that should make it different to others.

Mr. POPE: Have you considered the Corporation and their position? Is there any reason why the Nottingham water-works should be taken out of the Company's hands, and put into the hands of the Corporation?

Witness: I think not; and up to the present time it has not been the practice of Parliament, without some good cause, to give Corporations power to take properties from Companies compulsorily. And in this case I cannot see that there has been any lacking in duty. As far as I know, there is not any power which the Corporation, as a Sanitary Authority, could exercise, if the water supply were in their hands, that they cannot



exercise now. There is no allegation that at the present time the sanitary wants of the inhabitants are neglected by the Company. I should consider it a great hardship if auction clauses were imposed upon the Company.

Cross-examined by Mr. VENABLES: I agree with Mr. Hawksley that the Company have acted very liberally to their customers by allowing them to take as much water as they like. In restricting waste they have also been most liberal. They might have added to their rates without being extortionate. They are entitled to credit for keeping their rates so low and paying full dividends.

Mr. Hawksley said: I wish to supply a correction in my evidence. On the first day of the inquiry I was asked about how the capital was expended. We expend about £5000 a year in the whole of the district, in extensions and improvements. I gave only £2000, which would be the amount for extensions in the new town; but there is £3000 a year for extensions and improvement in the old district, and that would give us £5000 a year for the whole district, for extensions.

This was the case for the Water Company.

Mr. VENABLES then addressed the Committee in opposition to the Water Company's Bill, and in favour of the Bill of the Corporation for compulsory purchase of the Company's works. He said: The two things are inseparably connected, and I may say that the substance of our petition is that if the Committee do not give the Corporation the power of compulsory purchase, then they shall, as to the issue of any new capital that may be considered necessary, impose upon the Company the auction clauses under which the Company existed until four years ago. The effect of this will be very much like that of compulsory purchase by the Corporation, for under those clauses the capital will be raised at the market price of the money, without premium to the Shareholders, and that is the main and central reason that the Corporation urge for the purchase of the undertaking. If the auction clauses are imposed the Corporation will be less urgent in wishing to get the works. They would prefer to acquire the works for various reasons, and probably the Company would cling less to the property if it was understood that they were not to make a profit out of the consumers, but that their capital should be provided at the natural market rate. With regard to administrative details, they become less important in a case where, as I admit it has been here, the Company's administration has been good; where there is ill administration it is of great advantage, apart from the cost of works or new capital, to put the control of these undertakings in the hands of the Corporation. Here, while the good management continues, I admit that the necessity is less. We might, of course, have done what is often done, we might have collected complaints and grievances, and 170,000 people are never without complaints which they are willing to find an opening for. We might have dealt with petty points, such as that of one of the wells being, as one of the witnesses has acknowledged, not so good as the others. But these are not considered in our case, and it is, while acknowledging that the Company have done their work well that we submit the reasons for the purchase of the undertaking, or as an alternative, the auction clauses. The Company themselves have given a sufficient illustration of the advantage of these auction clauses. Upon the moderate capital of £75,000 the Company continued to go on extending their works, supplying the wants of the town, and managing everything exceedingly well for nine years—until 1854. The Company then required an additional £150,000, and again the auction clauses were inserted. At that time there was some interference on the part of the Corporation, but how far this produced the auction clauses I am not in a position to show. It is evident, however, that it must have been to the interest of the Corporation that the money should be raised at the lowest possible rate. Whether the auction clauses in this instance were adopted voluntarily or by pressure, they again raised the money on the auction clauses. They increased their capital from £75,000 to £150,000, and they have raised and spent altogether £350,000, or, in fact, they have spent £275,000—because £50,000 was shown to be fictitious and imaginary, being the result of the alteration in 1854. They got, then, £250,000 at 5 per cent. of nominal capital; but, as Mr. Hawksley said, it would not have mattered if it had been 100 per cent., because the auction clauses were there, and the capital must be raised under their provisions. The Company went on extending their service, and providing for the exceptional case of enclosure mentioned by Mr. Hawksley, for 20 years, and that with their capital, £100,000, obtained in 1854. In the interval they made two attempts to obtain additional capital, but in neither case did they succeed. I should say, however, that in addition to expending £100,000, they incurred liabilities to the extent of £200,000 or £300,000, so that the total expenditure may be stated at £130,000. It did not matter to them whether they used the share capital or not, but as a matter of fact they did use it, and did not call up the debentures. Premiums on shares, nominally 5 per cent., were added to the capital, but did not carry dividend. In 1869 they applied for £250,000 of share capital without the auction clauses. That Bill was opposed by the Corporation, on the ground that the 7 per cent. the Company wanted was what they ought not to have, and also that the auction clauses ought to be imposed. The Bill was defeated. In 1873 the Company again came to Parliament, and asked for £250,000 without the auction clauses, and with 7 per cent. Again the Corporation opposed, and again their opposition was successful, and the Company remained without their new capital and with their auction clauses. But in 1874 they came to Parliament, having reduced their demand from £250,000 to £100,000, which shows you how very capricious the demands of these Companies are. They asked for less than half the original sum, because no doubt they thought they would be more likely to get it. They asked for this at 7 per cent., and proposed to omit the auction clauses. The Corporation again opposed, and succeeded in reducing the 7 to 5 per cent., but did not get the auction clauses retained. That decision the Corporation have had great reason to regret. As you have heard, Mr. Hawksley, though knowing that part of that capital—namely, £20,000 to £30,000—was required to discharge existing liabilities, informed the Committee that this £100,000 would probably last from 16 to 20 years; but the result of the auction clauses being removed was that, whereas £100,000, with £28,000 obtained from premiums on shares, had sufficed from 1854 to 1874, £150,000 have only sufficed to carry the Company from 1874 to 1878. Within a few months after the Act was passed, the whole of the new £100,000 was issued nominally in shares of £19 5s., and this although the capital could not have been required then. It was issued, and was immediately saleable, and was in many cases sold in the market at four or five premium, so that the Act of Parliament was at once turned into a bonus for the Shareholders before a single shilling was required for the undertaking. Of course, the premium has increased as the capital has been called up, and the whole of the capital has been called up since. These shares are, no doubt, now of the same value as the others, so that if you take £100 stock of them it would be £150, and the shareholders will have paid up within three years—because it was called up in 1877—£100,000, and the property has been worth £150,000 in the market. Therefore, for the benefit of this money, spent in a fourth or fifth of the time in which it was said it would be spent, the town has had to pay £50,000—for this amount does come out of the consumers in the long run; and if Parliament could have foreseen that result, it is extremely improbable that they would have removed the

auction clauses, the existence of which would have prevented this state of things. The Company's interest in spending as much capital as possible, and as fast as possible, has produced that liberality of which Mr. Hawksley boasts. He says the Company are liberal in meters and pipes, and in other things they are unusually liberal; but Mr. Bramwell says it is all capital expenditure, and the more capital they can expend the better off they are. Here in the present Bill they are applying for more capital, their ground being their desire to include these outlying districts in their area. But Mr. Hawksley puts the cost of including these places at £80,000, and they want £150,000, which will be immediately converted into a bonus of £75,000; and I think I can see grounds for a further application, in the desirability of extending the supply to Trowell and other places not included in this Bill. That will be an excellent ground five years hence for another application to Parliament. I do not say that all these things are deliberately contemplated, but this is likely to be the course of events unless the auction clauses are inserted, or, which would be simpler, the Corporation purchase the works. You, sir, examined Mr. Hawksley at some length as to the purposes to which this money is to be applied, and you will be able to judge how far he exhausted the amount. My learned friend did not cross-examine him on that ground, for this reason—our contention is not really that the sum should be reduced, but that, if granted, it should be on such terms as not to impose an additional burden on the community. We do not materially object to the Bill if the auction clauses are imposed, because then the money will not be called up till it is wanted. When the Company had expended the whole of their £100,000 of share capital, they had still left £47,000, since reduced by £7000 of other debentures, and because they would make no profit by issuing debentures they did not issue them, although Parliament had given them that power. Part of them were under the last Act, and part under the old Act of 1851. Not only did they not issue further debentures, but they bought in old ones. They had certain mortgages, and what they did was this—the capital which had been granted by Parliament, because it would be required in 17 or 20 years for the supply of the district, they applied to the extent of nearly £80,000 to paying off these mortgages, which probably they need not have paid off—indeed, nobody had said that the mortgagees wanted them paid. The result is that this was converted into share capital, and they have now unexpended, a power of £40,000 of borrowing, and Mr. Hawksley says that they have £28,000 in value of land, and, from what he says, we are justified in assuming that the land is worth that amount. This sum, therefore, added to the £40,000, gives £68,000, and that is a considerable sum. A nominal grant of power to raise further capital would, as I say, do us little hurt; but nobody, I maintain, has the right to obtain money until it is wanted. In this case Mr. Hawksley says the auction clauses were voluntarily introduced, and my learned friend treated them as a paradoxical innovation. They were put in several Acts of Parliament, but where subsequent capital has been raised they have been struck out, and struck out probably on such a contention as that of Sir Edmund Beckett. What the practical effect has been I have shown you. The auction clauses have been re-introduced of late years in a case scarcely distinguishable from water—namely, that of gas, and the financial principles of gas supply are precisely the same as those of water supply. Under Acts passed in the year 1847, for providing a maximum statutory dividend and reserve-fund, both Water and Gas Companies were compelled to reduce their rates. The Standing Order with respect to Gas Companies is this:—"That in every Bill provision shall be made for the offer of such capital by public auction or tender at the best price which can be obtained, unless the Committee on the Bill shall report that such provision ought not to be required, with the reasons on which their opinion is founded." Therefore the rule is that there is to be an auction or tender clause, unless there is something exceptional. There is to be such a clause inserted in every Bill, unless there is something very exceptional with regard to it. The corresponding Standing Order of the House of Lords is, that in every Bill by which an existing Gas Company is authorized to raise additional capital, unless the Committee on the Bill shall report that such provision ought not to be required in the interests of the public, and the reasons on which it is founded, the auction clause shall be inserted. The House of Commons have given the Committee power to insert a sliding clause, but not so the House of Lords, who have not even thought proper to refer to it. These things were first introduced in private Bills, and afterwards incorporated in the Standing Orders. The sliding scale was proposed to the House of Commons in 1875, in a Bill in reference to the Gas Companies of London. That measure was projected by the Metropolitan Board of Works and the Corporation of London, and its object was to make provision for the control of the Gas Companies. It was referred to a Committee specially selected—a hybrid Committee presided over by Mr. Forster, the member for Bradford. They had a very long inquiry, and the result was they adopted the sliding scale. Directly the sliding scale was introduced, the auction clauses were also introduced as a matter of course. The result was that both Houses resolved on making the auction clauses a Standing Order, and the Companies have no longer any of those prospective advantages they may have had before. The object of the Legislature was that money to be raised for a public purpose should be raised on the lowest possible terms that could be obtained. The best thing that can be done in the present case is for the Water Company to agree to the sale of their undertaking to the Corporation of Nottingham. This will put an end to discussions about capital. There is a proof of the general feeling in favour of the purchase in the fact that the Corporation wish it—and it must be remembered that they represent the wishes of their constituents. Sir E. Beckett says it takes a long time to change the members of the Corporation; but it so happens that, last year, Nottingham passed an Improvement Bill, and under the provisions of that measure there was a new election, so that at the present time the Corporation represent the opinions of the people of Nottingham up to last November. A matter such as this now before the Committee is pretty nearly sure to be taken into consideration by the ratepayers in the choice of representatives. The question now comes whether there should not be a compulsory purchase. Mr. Hawksley is opposed to it; but his opinion finds fewer and fewer supporters every year, and transfers are continually taking place. No doubt, as some of the witnesses suggested, the Company are holding back so that they may get better terms. But the terms we are disposed to offer have been included in a letter addressed to the other side yesterday. We are prepared to give 30 years purchase of the maximum parliamentary dividends, to pay up arrears of old dividends—which, I see, amount to £6000—to pay off the mortgage debts, and all debts and obligations, and pay such sums for officers, &c., as may be agreed upon. The Council will undertake to supply the district proposed to be included in the present Bill.

Mr. MICHAEL: It is impossible that you can pass this portion of the preamble without evidence.

Mr. VENABLES: I did not suppose that this letter required proof. You have it in your hands. If you want more than I have said, I will tell you that I now make this offer on the part of the Corporation.

Mr. MICHAEL: You must give evidence.

Mr. VENABLES: The offer we have made to them is equivalent to giving them £150 for every nominal £100 we take, and to pay 6 per cent. for each



£100, with the option of 25 years purchase; or 30 years purchase of their undertaking, which works out to the same thing. Further than this, the Corporation think it is important to the interests of the town that they should acquire the works; and, if the Committee should think that 6 per cent. is not enough to give them, they are willing to go to the extent of 6½ per cent. They will abide by the decision of the Committee. That is the offer we make. Mr. Bramwell mentioned the expectation of prospective value, but that has been allowed for in the present market value of the shares. There can be no doubt that a considerable part of the present price is owing to the expectation of the purchase we are now endeavouring to bring about. The result of what we propose would be to do the fullest justice to the Shareholders. Since the Committee heard Sir E. Beckett's speech, a decision has been given in another room, in which compulsory purchase, or something very like it, has been allowed.

**The CHAIRMAN:** Do you mean in the Cheltenham Water Bill?

**Mr. VENABLES:** Yes. The Committee have put a strong pressure on the Company; because, although they have not decided the question, yet they have thrown out the Company's Bill, and have adjourned for the purpose of enabling the Corporation to come to terms with the other side as to the price to be paid for the undertaking. It has been said that there is no precedent for a compulsory purchase, but against that I have to point out that a good judge never goes beyond the absolute necessity of the case. The question here is not one between two competing Companies, but between two kinds of administration, and two modes of raising capital. We, the Corporation, must raise capital as cheaply as possible, whilst it is to the interest of the Company to raise capital as abundantly and profusely as possible. If the Committee should think that precedent is not sufficiently established for compulsory sale, we ask for the alternative of auction clauses.

**Alderman Thackeray,** examined by **Mr. VENABLES.**

I think it is desirable that the undertaking of the Water Company should pass into the hands of the Corporation, who have always been willing to pay a fair price for it. It is desirable because the capital could be raised at a cheaper rate, and there are many other reasons to be urged for the transfer of gas and water works to Corporations. I see no reason why the Company should hesitate to transfer their works, supposing they can get the full value of them. The Corporation have no unfriendly feeling towards the Company, and have no wish to deprive them of their rights. I believe that, at the last municipal election in Nottingham, this question was one that weighed considerably with the ratepayers. The same feeling now exists among the ratepayers in general in favour of the transfer. I think that what is proposed would be perfectly fair to the Company, at least; but we think it far better to have compulsory sale. We still hold ourselves bound by the original proposal of transferring the works by open arbitration. It would be much better if the works were transferred amicably than by arbitration. Let the Company consider that we offer 6 per cent. instead of 5 per cent., and we are so anxious to do everything that is proper and fair that we are willing to put ourselves into the hands of the Committee to the extent mentioned, of making it 6½ per cent. if the Committee should think 5 per cent. not enough. We are quite ready to abide by the decision of the Committee to that extent.

**Mr. VENABLES:** My learned friend, Mr. Michael, has said that, technically, I am bound to call witnesses. I am not aware that I am bound to call a witness. If I do call a witness it will simply be to corroborate what I say. There are a number of gentlemen from Nottingham, members of the Corporation of Nottingham, among others, whom I could put into the box; but they would only tell you what I can tell you much more shortly, that the transfer of these works is much desired by the inhabitants, and that it would result favourably to them if it were done. But I will not trouble the Committee with evidence. As I have said, the witnesses could only give evidence in corroboration.

**Mr. MICHAEL:** This is a case of two competing Bills. It is quite true that if we withdrew our petition against the Corporation Bill it might go before another Committee as an unopposed Bill. But that has not taken place, and my friend must call witnesses to endeavour to substantiate the preamble of his Bill. I pass for the moment from his allegations, and I would remind him that there are gas and improvement clauses as well as water clauses; and, as I have said, the two Bills being competing Bills, the first question to be decided is the power of supply.

**Cross-examined by Mr. MICHAEL:** The introduction of auction clauses into the Company's Bill would enable them to raise money at the market value. It is to the interest of the ratepayers that this should be done. No complaints whatever have been made as to the conduct of this undertaking. I think if the Corporation had it in their own hands, they would be more careful of the expenditure incurred in the supply of water. By withdrawing the auction clauses, there is an inducement to the Company to spend money lavishly in order to get premiums. I am rather astonished they have had to come to Parliament again so soon. If the undertaking were transferred to the Corporation, the Engineer of the gas-works could be the Engineer of these works, with perhaps some slight addition to his salary, and in that way money would be saved. I do not say that the Company have come to Parliament to ask for money for which they have no call, but I say that if the concern were in the hands of the Corporation, instead of paying 5 per cent. upon £150,000 they could raise money at 4 per cent. It will be no benefit to the Shareholders if the new capital is to be raised by auction. If the power to raise the new capital required for water-works purposes were transferred to the Corporation, it would be a benefit to the Shareholders, because it would enable the Corporation to increase the dividend they propose to give them.

(To be continued.)

**EFFECT OF SULPHUR IN GAS ON COTTON GOODS.**—At the last meeting of the Chemical Section of the Philosophical Society of Glasgow, Dr. William Wallace, Gas Examiner and Public Analyst for the City of Glasgow, read a short paper on the destruction of the colour of cotton goods by the sulphur in the gas burned in the London warehouses. Sulphuric acid, he said, was found in considerable quantity in the goods after being some time exposed, while the same articles in the fresh condition were quite free from that acid. In some cases the cotton fibre itself was rendered so tender as to be perfectly useless. The same thing had been observed in the warehouses in several large towns in England, such as Leeds, Manchester, &c., where common coal, containing much sulphur, was used as the source of the gas supplied to the consumers, but only to a limited extent. The remedy which was recommended by Dr. Wallace was the thorough ventilation of the warehouses, so as to ensure that the sulphurous and sulphuric acids generated by the burning of the gas might have a sufficiently free escape into the atmosphere. He also suggested the free use of lime for whitewashing the walls of the warehouses, so that the acid vapours floating in the more or less confined air might combine with the lime. He exhibited a number of specimens of the goods which he had examined after they had been sent back by the London merchants as damaged to the manufacturers. Both in colour and in strength they were seen to have suffered detriment by exposure to gaseous fumes.

## Miscellaneous News.

### IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary Meeting of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, on Monday, May 27—Sir JULIAN GOLDSMID, Bart., M.P., in the chair.

The SECRETARY (Mr. Albert F. Jackson) read the advertisement convening the meeting, and the corporate seal was affixed to the register of proprietors. He also read the following report:—

The present half-yearly ordinary meeting of the Shareholders has been convened, agreeably to the Company's Act of Parliament, for the purpose of receiving a report from the President and Directors upon the affairs of the Association, and for declaring a dividend for the half year ended the 31st of December last.

**Gas Made.**—The total quantity of gas made at all the stations in the half year ended the 31st of December last was 2698 million cubic feet. The total quantity made in the corresponding half year of 1876 was 2614 million cubic feet, showing an increase of 84 million, or at the rate of 3·21 per cent.

**Lights.**—The total number of lights at all the stations on the 31st of December last was 1,155,388. The total number on Dec. 31, 1876, was 1,095,671. These figures show an increase of 59,717, or at the rate of 5·4 per cent.

**Mains.**—The total length of mains laid up to the 31st of December last was 1134 miles. The total length of mains on Dec. 31, 1876, was 1077 miles, being an increase of 57 miles. Much attention has, as usual, been given, during the period now under review, to maintaining the various works in a thoroughly serviceable condition.

Mr. G. W. Drory has continued to exercise the general superintendence of the affairs of the Association on the Continent, and has received, as hitherto, the hearty assistance and co-operation of the several Engineers and Agents.

The Directors have had reason to be satisfied with the results of the work undertaken by Mr. Wingfield; consequently that gentleman has been permanently appointed as General Inspector of the Accounts of the Association on the Continent.

The rental and the profit for the half year ended the 31st of December last were greater than for the corresponding half year of 1876.

The cost of the coal employed in the half year now under review was less than that of the coal used in the corresponding half of 1876.

**Secondary Products.**—There was a considerable diminution in the value of two of these—viz., of 14·62 per cent. in the coke, and of 8·32 per cent. in the tar. There was, however, an increase of 19·78 per cent. in the value of the ammoniacal liquor.

In the half year under consideration, considerable sums were expended for improving the purifying apparatus at several of the stations, the most important items under this head being at Vienna for scrubbers and purifiers, and at Amsterdam and Rotterdam for purifying-houses.

In order to keep pace with the increased demand for gas, a large gasholder (100 feet diameter) was erected at Tabor, one of the Vienna stations, for which a tank and house were also completed.

At Schöneberg, a suburb of Berlin, a large sum was spent on account of a new tank (102 feet diameter).

At Antwerp also, at the Dam works, the erection of a new tank and new gasholder (80 feet diameter) necessitated a considerable outlay.

The erection of new offices and of a new Engineer's dwelling-house were completed at Berlin, and similar buildings were proceeded with at Ehrenfeld, our station, near Cologne.

A short railway branch from our works at Forest, near Brussels, to the Forest station, was completed during the half year at a heavy cost. It is hoped, however, that this may be compensated for by a considerable saving in the carriage of coal and materials.

For extensions of the system, and the substitution of larger for smaller mains at the various stations, large sums were spent, more particularly at Vienna, Amsterdam, Berlin, and Frankfurt.

At Vienna, additional land was purchased for the extension of the Tabor works, and in the suburb of Baumgarten for the erection of new works.

At Haarlem, where the Association has been much in want of room, some land was bought.

At Frankfort-on-the-Maine, a new contract was concluded, during the period now under consideration, for lighting one of its suburbs, the commune of Hausen.

A most painful duty is imposed upon the President and the Directors of formally announcing the death, by a railway accident on the 2nd inst., of their highly esteemed and valued colleague, Sir Francis Henry Goldsmid, Bart., M.P., to whom, in no considerable degree, the Association has been indebted for much valuable assistance afforded during a period of nearly 26 years, and who at all times took the greatest interest in its progress and success. Sir Francis Goldsmid ever most willingly brought to bear upon the counsels of the Board, and for the benefit of the Association, great legal tact and experience, and a sound and ripe judgment.

The President and the Directors desire in conclusion, to draw the attention of the Shareholders to the accounts for the half year ended the 31st of December last. These have been duly audited, and from them the Directors have, in accordance with the provisions of the Companies Clauses Consolidation Act, prepared a scheme showing the profits of the Association for the last half year, and the portion thereof applicable to the purposes of dividend which the President and the Directors recommend now to be declared—namely, a dividend of £2 10s., and a bonus of 10s. per share, payable, free of income-tax, on and after the 15th of June.

The Directors who go out of office by rotation are Thomas Henry Goodwin Newton, Esq., Colonel Josiah Wilkinson, and Philip Twells, Esq., M.P. The Auditor who goes out of office is Thomas Newton Stokes, Esq. These gentlemen are all eligible for re-election, and offer themselves accordingly.

The CHAIRMAN: Gentlemen, on behalf of the Board I have to move—"That the report upon the affairs of the Association now read be received, adopted, and entered on the minutes." The few observations I have to make in reference thereto will not, I think, detain you very long. The accounts speak for themselves. You are aware that the price of coal has been very low, and, as I have often stated before, and as has been stated by my predecessors, Gas Companies must mainly depend for their profits on the price of coal. The residual products, and especially coke, have not been so good in their results as they are when the price of coal is higher; and that is always "the other side of the question" in this matter of profits arising to Gas Companies. The total results of our operations for the half year under consideration is eminently satisfactory. The Board, as you are aware, have been endeavouring, for some years past, notwithstanding the very large sums that have been expended on capital account, as the profits therefrom necessarily and properly increase, whether bound by contract or not, to give the consumers every reasonable advantage which they could fairly expect from the Association. They have thought it, therefore, their duty, as far as possible, to adopt everything which might be of benefit in the working of a Gas Company—or rather I should say everything that has been proved to be of benefit, whether in the matter of production or purification, and, of course, the result has been that we are, as I think, able to show that our works are in a thoroughly satisfactory condition. Now the final result of the half year's proceedings is that we are able to propose to you to-day a dividend of £2 10s. per share, and a bonus of 10s. per share. Last half year the dividend was £2 per share, and there was a bonus of 15s. per share. Now, as I have pointed out before, of course, the half year under consideration is the best half year, because it is the winter half year, and consequently the profits of the other half are never so good. But we think that we see our way permanently to give a dividend of £2 10s. per share, and for this reason we have announced it at that rate on this occasion, instead of £2 as last half year. The other part—the bonus—must, as I have before pointed out, depend partly upon which half year it is, and partly on the prevailing price of coal at the time. If coal rises to a considerable extent, there will be no bonus at all; if it remains low, I think you may fairly expect to get a bonus on future occasions. There is another matter to which I think I ought now to refer, and that is the question of our capital account. At very many meetings which have been held here in the past the Shareholders have expressed a desire, in which the Board have concurred, to write up the uncalled amount of £6 5s. on each share, and you will remember that I told you last year that, as the result of the opinion of Counsel, we found we should be obliged to go for an Act of Parliament to obtain the



necessary permission to do this. I was unable to be present at the meeting, at which Mr. Wood presided, which was held for the purpose of obtaining your consent, which I believe was unanimous, to the Bill which we introduced into Parliament this session. I am happy to say that that Bill has, with some slight modification, become law, and therefore the uncalled amount on the shares of the Association is now considered to be written up out of the sums which from time to time have been expended from profits for the enlarging of our works. In addition to that, we have succeeded in obtaining other powers, which, as I stated before, we thought it very desirable to obtain, and which, I believe, will be of great importance in the future history of this Association, and will prevent the necessity for going to Parliament again for the same object. It is well known that we spend, on capital account, a considerable sum of money every year out of profits; we have, therefore, taken power in our Act, from time to time, when we think it desirable, to distribute *pro rata* among the Shareholders capital stock to represent the amount so employed by us for capital purposes. I think that is eminently in the interests of the Shareholders, and it is a very great advantage that we should have that power completely in our own hands. It will obviate any difficulty in the future such as there has been in the past, and I think it will place the Association on a most satisfactory footing. Then there is another matter upon which I should like to say a few words. Of course, as every Proprietor knows, with 14 stations in different parts of the Continent, we have many varying systems of business. But we have thought that the time has come when, if we could get a man capable of undertaking that class of work, it would be desirable that the whole of our accounts should be established upon a uniform system, although they are in different countries. We consider ourselves, therefore, fortunate in having secured the services of Mr. Wingfield, who is the right man for that purpose; and he has begun to initiate a system which must involve a considerable amount of time and trouble, but up to this present he has shown that he is sparing neither the one nor the other. In the permanent appointment of Mr. Wingfield, we think we have been able to do a valuable service to the Association. In order to give the Proprietors an example of the work which can be done well by a man of that character, I will just mention a fact that has occurred at Vienna. Our Chief Accountant and General Cash Agent there is a man in whom the Directors of the Association have had great confidence for many years. He has lately begun to yield to that ill to which all men must submit—he is getting old; and he was training up a son to assist him. But that son died two or three years ago, and the result has been that a certain amount of remodelling of the office has been required. But in order to remodel an important office like that in which the business of a Company lighting a town of 600,000 or 700,000 inhabitants is carried on, great care and prudence are requisite, as well as peculiar judgment in the selection of individuals. Mr. Wingfield has been at Vienna for several months past undertaking that duty, and, as far as we are able to judge, he has accomplished it, not only to our satisfaction, but in the very best manner in which it could be accomplished. It is a kind of work requiring a man of judgment and discretion and great tact, and Mr. Wingfield, in these respects, has shown that he is worthy of our confidence. Now, there are only two or three other points to which I have to refer on behalf of the Board. The Association has arrived at a period of prosperity when a difference of opinion is scarcely ever heard at its half-yearly meetings. In times long gone by—I think long before I had anything to do with the management of the business of the Association—we were neither so happy in the payment of dividend—because, I believe, at one time, we paid no dividend at all—nor so happy in the unanimity which now exists between the Shareholders and the Board. I say happily that time has long gone by. My uncle (Sir F. Goldsmid), whose loss we all deplore, has often, at the time when those differences of opinion existed, done good service to the Association; and I think, owing to his judicious management and that of others, it came to be seen after a while that it was to the interest of both Board and Shareholders that there should be more unanimity and more cordiality. With increased prosperity we have arrived at that unanimity; and thinking on this point, there is one thing which it seems to me ought to be a source of congratulation to us all—I mean that the gentleman who from the first has been so active in attending to the business of this Association (Sir Moses Montefiore) is still our President. We had hoped to see him here to-day. He attended a Board meeting last Wednesday, and seemed as active and zealous as ever. He continues to take the intelligent and anxious care for the interests of the Association which he has manifested for the last 54 years. Gentlemen, I think I have nothing further to say on behalf of the Board. We have been desirous during the past half year, as in former periods, to do all in our power to serve the interests of the Shareholders, and to meet all their reasonable wishes and expectations. I think, especially in the matter of the Act of Parliament of which I have already spoken, we have done our best, and that in the result we have been most successful. If there is any point upon which the Shareholders require information, I shall be ready to give it, and with these few words I move that the report be received and adopted.

Mr. Wood seconded the motion, which was put and carried unanimously.

On the motion of the CHAIRMAN, it was resolved that a dividend of £2 10s. per share and a bonus of 10s. per share be declared upon the 56,000 shares of the Association for the half year ended the 31st of December last, and that the said dividend and bonus be payable, free of income-tax, on and after the 15th of June.

The retiring Directors, Mr. T. H. G. Newton, Colonel J. Wilkinson, and Mr. P. Twells, M.P., were severally re-elected.

The retiring Auditor, Mr. T. N. Stokes, was re-elected.

It was then resolved that the cordial thanks of the meeting be given to the President, Chairman, and Directors, for their able management of the affairs of the Association, and to the Chairman for his conduct in the chair that day.

The CHAIRMAN acknowledged the vote, and said he could speak for his colleagues as for himself, when he said that they were most happy in having conducted the affairs of the Association to a result so favourable as that now witnessed, and in closing the proceedings of the meeting, he would propose a resolution, which he was sure would be heartily responded to—viz., that the thanks of the Shareholders be given to Mr. G. W. Drory, the General Superintendent of the affairs of the Association on the Continent, and to the Agents, Engineers, and other Officers of the Association.

The motion having been adopted, the proceedings terminated.

QUALITY OF THE BIRMINGHAM GAS.—Mr. Thomas Jackson reports that during the month of May, at the four gas-making stations of the Corporation, he made 20 examinations of the illuminating power of the gas supplied to the borough. The maximum light in sperm candles was 17.72; minimum, 16.48; average, 17.16. The parliamentary standard is 15 candles with Sugg's No 1 "London" burner.

# BAHIA GAS COMPANY, LIMITED.

The Half-Yearly Meeting was held on Thursday, the 23rd ult., at the London Offices, 10, Coleman Street—HORATIO BROTHERS, Esq., in the chair.

The following report was presented:—

The Directors herewith present the audited statement of accounts for the half year ending Dec. 31, 1877.

The Directors regret to have to report a defalcation in the office at Bahia, amounting, as far as can be ascertained, to about £2000. Part of this has been written off the revenue account of the half year under review, in consequence of which the Directors are unable to make the usual addition to the reserve-fund, although the same dividends are recommended as before. As soon as the defalcation was detected, the Directors sent out a gentleman, well acquainted with Bahia and the Company's affairs, to make a searching investigation, which the Directors hope may result in the discovery of the weak spots in the administration at Bahia, and in removing the causes which have hitherto obstructed the prosperity of the Company.

The profits for the half year, £3624 18s. 5d., added to the balance brought forward, make the sum of £3907 19s. 2d., out of which the Directors recommend the payment of the preference dividends of 10 and 7½ per cent. respectively for the half year, and that a dividend of 3 per cent. per annum be paid on the ordinary shares. This will absorb £3825, leaving £282 19s. 2d. to be carried forward.

Dr. Balance-Sheet, for the Half Year ending Dec. 31, 1877.		Cr.	
Capital—			
5000 ordinary shares	£100,000 0 0	Concession	£7,000 0 0
1000 10 per ct. preference shares	20,000 0 0	Investment to June, 1877	101,014 6 8
1500 7½ ditto ditto	30,000 0 0	Additional during half year	371 11 4
Creditors—		Freehold land to June	4,705 2 7
On open accounts	1,970 8 1	Additional during half year	828 19 0
On acceptances	9,299 14 0	Meters fixed	2,882 0 5
Dividends unpaid	83 2 0	Office furniture and fixtures	364 10 2
Insurance-fund	47 4 10	Preliminary expenses	10,914 17 3
Reserve-fund	3,000 0 0	Suspense account—	
Profit and loss	3,907 19 2	Extension of retort-house, &c.	441 15 2
		Mains renewal	3,147 0 11
		Plant	511 14 8
		Amounts due for gas, fittings, &c.—	
		Public lamps	1,604 18 1
		Ditto establishments	4,024 2 6
		Private rental, fittings, &c.	6,757 10 2
		Sundry debtors	777 4 7
		Stock—	
		Coals	3,979 17 9
		Coke	36 0 0
		Fittings	3,275 14 5
		Sundries	2,400 4 6
		Goods in transit	3,350 3 4
		Bills receivable	2,000 0 0
		Cash at bankers—	
		General account	287 17 1
		Dividend account	63 2 0
		Bahia	526 7 7
		London office	9 14 0
		Bahia office	1,321 2 11
	£168,208 8 1		£168,306 8 1

Revenue Account.		Profit and Loss Account.	
Coals carbonized	£5,849 0 9	Gas supplied to public lamps	£9,702 2 8
Purifying materials and wages	222 3 11	Less fines	223 8 1
Carbonizing wages	1,214 15 2		£9,478 14 7
Wages, yardmen, &c.	234 10 0	Private consumers	6,282 19 10
Repairs, mains, and services	959 4 5	Public establishments	1,383 9 10
Lighting and repairing of public lamps	1,533 2 4	Meter-rental	533 4 4
Salaries	1,871 9 10	Products	£1,900 18 6
Directors' fees	400 0 0	Less labour	81 19 2
Auditors' fees	21 0 0		1,818 19 4
Rent and taxes	177 9 10	Transfer fees	1 0 6
Interest	192 3 3	Profit on fittings	475 17 4
Stationery	72 18 0		
Office expenses	25 1 2		
Trade charges	150 7 3		
Wear and tear	1,314 17 4		
Bad debts and allowances	176 9 0		
Law charges	7 2 0		
Exchange	229 9 2		
Extraordinary disbursements—			
Extension of retort-house—			
£1,078 19s. 6d. (last instalment)	179 16 7		
£1,274 16s. 3d. (5th instalment)	212 9 5		
£687 17s. 9d. (4th instalment)	114 12 11		
Renewal of mains—			
£585 16s. 5d. (3rd instalment)	97 12 8		
£3,424 19s. 0d. (1st instalment)	570 16 6		
Renewal of plant—			
£739 9s. 4d. (3rd instalment)	124 4 10		
Defalcation suspense account	400 0 0		
Balance—profit	3,624 18 5		
	£19,974 14 9		£19,974 14 9

Dividend declared Nov. 27, 1877.		Balance of account to June 30, 1877.	
Reserve-fund	£3,623 0 0	Revenue account, net profit for the half year ending Dec. 31.	£4,408 0 9
Balance	500 0 0		
	3,907 19 2		£4,408 0 9
	£8,032 19 2		£8,032 19 2
		Balance	£3,907 19 2

The CHAIRMAN, in moving the adoption of the report, said he much regretted the absence of Mr. Edward Horner, the Chairman of the Company, who was not at the present time in England. Referring to the balance-sheet, he said the gas-rental for the half year had been, on the whole, £328 18s. 2d. less than in the corresponding half year. The rental from private consumers was £424 less, and from public establishments £81 18s. 8d. less. The only item on that side showing an increase was the "Public lamps," which were £179 more. The Directors very much regretted this falling off in the rental, especially from private consumers. They had, on several occasions, directed the attention of their Manager at Bahia to it, but he was sorry to say, had never received what they considered a satisfactory explanation. The expenditure on coals, though 137 tons more had been carbonized, was £701 less—the average price for the half year being 34s. 5d., as against £2 0s. 1d. for the corresponding half year, showing a difference in favour of the present half year of 5s. 8d. "Carbonizing wages" were £112 less, and "Purifying" £110 less. The saving on the "Coal carbonized," "Purifying material and wages," and "Carbonizing wages," was £923. Another item which had very much increased on the side of expenditure was "Repairs to mains and services," which this half year stood at £959 4s. 5d., as against £369 19s. in the corresponding period. This had arisen from the relaying of the services



as they took up the mains; but as those services were no doubt in a very bad state, and a fruitful source of leakage, it was a very judicious expenditure. The other items in the account called for no particular observation. The extraordinary disbursements for the half year were £83 less; but there was one item, called "Defalcation suspense account," which appeared for the first time, and £400 had been written off towards the £2000 referred to in the report. The working had not been so good as they had a right to expect, but for all that the profit for the year was greater than in the corresponding one, if the extraordinary items were taken into account. The profit for the year was £3624 18s. 5d., and, adding the £400 and £590 for extra repairs, a gross total was shown of £4416 18s. 5d., as against the gross profit in the corresponding period of £3919. He had now to refer to a very unfortunate affair—the defalcation at Bahia. This defalcation was discovered in the London office by the Secretary. On comparing the balances reported to be at the bank and in hand on the 31st of December, and the balance on the following day, the 1st of January, a remarkable discrepancy of £1200 appeared. The attention of the Directors was drawn to this, and they immediately telegraphed to the Manager at Bahia. The Manager was taken completely by surprise, and the first telegram in reply was not very satisfactory. A second telegram stated that it was a defalcation, and not an error, and named the defaulter. The whole matter was so unsatisfactory, that the Directors lost no time in appointing a competent person to go out to make a searching examination of everything. Fortunately their late Manager, Mr. Kilkeary, at that time was not much engaged, and he was sent out at a few days notice. The Directors were awaiting his report before they could state definitely what would be the exact amount of the defalcation, and how it had occurred. Another thing which had occupied the attention of the Directors was the unsatisfactory working, shown by the diminished rental at Bahia for the last two and a half years. The gross rental per ton in the half year ending the 31st of December, 1875, was £5 3s.; for the half year ending June, 1876, £5 16s. 11d.; December, 1876, £5 7s.; June, 1877, £5 5s.; and December, 1877, £5 0s. 9d., showing a gradual decrease in five successive half years. The products, also, during the same period, had greatly diminished, from 13s. down to 10s. 7d. a ton. All these matters together induced the Directors to send out a gentleman, at considerable cost, to make a thorough investigation into the whole of the working of the Company, and to go, if possible, through all the meters. He (the Chairman) was satisfied, as an old gas man, that with honest management at Bahia their Company would be a good paying concern; they merely wanted energy and honesty. The Company, unfortunately, never seemed to be able to get into smooth water, for as soon as they got over one difficulty another arose. He believed, however, by getting a proper Manager, affairs would be improved. He believed their present Manager at Bahia was honest, but still he had not done what he ought to have done, because, if he had, this defalcation could not have occurred. He (the Chairman) had been a Shareholder in the Company for 16 years, and had seen its various vicissitudes. It began wrong with a very heavy capital, burdened with an awful amount of preliminary expenses, but, for all that, he believed there was great vitality in it. He had no hesitation in saying that, with a little patience and a little different management at Bahia, it would go right, and the Shareholders would receive very much better dividends than they had hitherto done.

Mr. CLARKE seconded the motion for the adoption of the report.

The CHAIRMAN, in answer to a question from a Shareholder, said that the servants of the Company now at Bahia were not elected by the present Board, and no security seemed to have been taken.

Mr. FINLAY said they had security with the Manager for £1000. The other officers were in their places when the Board came into possession; no security had been given with them previously, and that arrangement had not been disturbed. He believed from that day that every officer in connection with the Company should give security.

The CHAIRMAN said the Board had taken security from every person appointed by them. The present defaulter was an Englishman, engaged in England by advertisement, and he was recommended as "in every way suitable, and thoroughly honest and reliable."

Mr. YOULE said he knew a great deal of Brazil, and he believed the great want of the Company was to have some gentleman on the Board who had a thorough acquaintance with Brazil. He knew other Companies where they had the benefit of such assistance. The Rio de Janeiro Gas Company owed its success mainly to Mr. James. That was a Brazilian Company brought out for £6000, and now it had doubled its capital. When they first commenced no one would use gas, but Mr. James was able to induce the private residents to consume gas. What they wanted, therefore, was to appoint some gentleman to assist the Manager, who was well acquainted with the country, and would induce the public to consume gas. He felt it was impossible to strengthen the Board as a Gas Board, but looking to the Company as a commercial concern, he believed it would be an advantage if some gentleman were placed upon the Board who had an intimate acquaintance with Brazil.

The CHAIRMAN said unfortunately for the Company they had no Brazilian Shareholders at Bahia. They had been negotiating with a gentleman who had intimate commercial connection with Brazil, to see if they could appoint a gentleman to look after the concern, more as an Auditor, and they hoped to be able to appoint some one of that description. It was not that the Board so much required advice at London, but what was wanted was a sort of Inspector at Bahia.

Mr. FINLAY said it was only fair to say they had an interview with Mr. James at the Board, and would have been very pleased to see him there. They should only be too glad if any gentleman connected with the Brazils would take a seat at the Board, and give them that assistance they might possibly stand in need of.

Mr. YOULE said he did not think a gentleman at Brazil would take the position, because it would be impossible for a merchant, or any one engaged in business, to devote his time to the Gas Company. What was required was a gentleman on the Board who was acquainted with Bahia, and a clerk out there who knew the country well. He knew very well that Mr. James was so thoroughly occupied that he could not possibly give his time to attend the Board, but probably there would be no difficulty in finding other gentlemen of experience who would join if necessary.

Mr. FOOTE suggested the appointment of a Local Committee, who would, no doubt, for a nominal sum, superintend the finances over there.

The CHAIRMAN said they had no Shareholders at Bahia, and a Local Committee must consist of Shareholders. They could, of course, appoint an Auditor who was not a Shareholder.

Mr. FINLAY said an auditor would be able to keep a thorough check upon the finances. There were also other matters. The loss of gas had been something like 30 per cent. of the total make, and if that could be reduced one-half it would tell a very handsome tale. He did not wish, at that stage of the proceedings, to introduce the name of any individual, but it did appear that certain persons in Bahia had been greatly to blame. The Directors had sent out everything they had been requested to—main-pipes, and all materials for reducing the leakage—but up to the present moment there was very little improvement. It seemed as if they wanted some one to take the management of the works as well as the management of the

finances. For his own part, he believed that the leakage had not all taken place from the pipes.

The CHAIRMAN said, if Mr. Youle could recommend any gentleman to join the Board, the Directors would be very glad to entertain the proposition.

The resolution for the adoption of the report was then agreed to.

On the motion of the CHAIRMAN, a dividend for the half year at the rate of 10 per cent. on the 10 per cent. preference capital,  $7\frac{1}{2}$  per cent. on the 7 per cent. capital, and 3 per cent. per annum on the ordinary capital, less income-tax, was declared.

On the motion of Mr. YOULE, a vote of thanks was passed to the Chairman and Directors.

A vote of thanks to the Secretary (Mr. A. J. Head) was proposed by Mr. S. P. BOSTOCK, and having been adopted, the proceedings terminated.

#### MONTE VIDEO GAS COMPANY, LIMITED.

The Sixth Ordinary General Meeting of Shareholders of this Company was held on Thursday, May 30, at the City Terminus Hotel—Mr. J. BRAMLEY-MOORE, presiding.

The SECRETARY (Mr. J. T. Denniston) read the advertisement convening the meeting, and the minutes of the last meeting, which were approved.

The following report of the Directors was taken as read:—

The Directors submit to the Shareholders the annexed statement of accounts for the year ending Dec. 31, 1877.

The progressive increase of the Company's business has been in some degree arrested during the period of commercial depression which has characterized the past year; the results, however, may be considered satisfactory under such circumstances.

The net profit on the year's working amounts to £49,388 14s. 4d., out of which the Board have passed £6000 to contingency-fund, which is thus raised to £31,000.

The balance remaining at the credit of profit and loss account—adding that brought forward from 1876—amounts to £43,896 2s. 5d., which sum will become available for dividend when received.

The Directors, for the present, are compelled to postpone the recommendation of a dividend, owing to the continued delay in the payment, by the Government of Monte Video, for public lighting; they are glad, however, to say that arrangements have been recently completed for the recovery of the whole amount outstanding, for which Treasury bills have been received. The Directors feel indebted to the Governor of Monte Video and his Ministers for the cordial manner in which they have met the wishes of the Board, and arrangements are now being concluded with the Government which will facilitate the collection of public lighting accounts, and, they hope, permit, at no distant date, of regularity in the payment of dividends, which the Directors have been anxiously striving to secure.

The Directors who retire by rotation are H. E. Visconde de Mauá and Alexander K. Mackinnon, Esq., who, being eligible, offer themselves for re-election.

The retiring Auditors, Messrs. Price, Waterhouse, and Co. and John Cater, Esq., offer themselves for re-election.

Cr.	Balance-Sheet, Dec. 31, 1877.	Dr.
Capital authorized— 30,000 shares of £20 each . . . £600,000 0 0 2,904 do. £20 do. unissued . . . 58,080 0 0		Cost of gas-works, mains, concession, plant, dock, and sundries, as per balance-sheet, Dec. 31, 1876, including meters . . . £542,020 8 4 Add expenditure during 1877, as follows:— Extensions at gas-works . . . 1,094 16 10 New mains . . . 668 8 4 Do. services . . . 682 10 2 Do. meters . . . 149 7 3 Dock, new deposit, finishing new pier, and other works . . . 650 0 0 Dock workshops and machinery . . . 1,033 16 2
27,096 do. £20 do., fully paid and issued to date . . . £541,920 0 0 Contingency-fund . . . 25,000 0 0 Amount carried to fund this year . . . 6,000 0 0 Sundry creditors, London . . . 14,125 9 2 Ditto, Monte Video . . . 668 15 0 Bills payable . . . 3,370 17 3 Dividends unpaid . . . 7,862 8 0 Profit and loss account— Balance, Dec. 31, 1876 . . . £22,184 4 1 Deduct dividend paid Dec. 28, 1877 . . . 21,676 16 0		Total capital expenditure . . . £546,299 7 1 Stock of coals at cost . . . 5,708 6 8 Do. gas-fittings . . . 7,062 14 9 Do. residuary products . . . 1,143 6 7 Do. materials in store for use . . . 6,013 3 0 Do. ditto sale . . . 1,628 14 3 Sundry debtors, gas consumers at Monte Video . . . 18,110 11 2 Furniture in London and Monte Video . . . 1,004 5 2 Acceptances in hand at Monte Video . . . 3,272 18 3 Bills receivable in transit . . . 10,000 0 0 Cash at Monte Video . . . 171 13 1 Ditto London . . . 9,751 4 3 Goods awaiting shipment and afloat . . . 2,677 4 7
Profit for 1877, from revenue account . . . £49,388 14 4		
Deduct amount carried to contingency-fund this year . . . 6,000 0 0		
Balance . . . £43,896 2 5		
	£612,843 11 10	£612,843 11 10

Cr.	Revenue Account.	Dr.
Cost of manufacture and expenses at Monte Video after making provision for bad and doubtful debts . . . £46,376 10 8 Directors' fees, salaries, and London expenses . . . 2,409 7 4 Income-tax . . . 526 19 3 Balance, being profit for the year . . . 49,388 14 4		Sales of gas, residuary products, rent of meters, sale of gas-fittings, &c. . . £93,130 1 5 Revenue from dock and workshops . . . 4,041 18 10 Interest account—balance . . . 1,504 6 4 Transfer fees . . . 25 5 0
	£98,701 11 7	£98,701 11 7

The CHAIRMAN said: Gentlemen, I can only say that we regret to meet you very much in the same condition as last year in regard to your dividend—that, although you will have a dividend, it will be deferred as on the former occasion; yet, on the whole, I think that the report we offer to you will be received as satisfactory. It will be satisfactory in so far that several alterations have been made by your Directors, and arrangements have been made with the Government, with the view to secure to you regular dividends at, I hope, no very distant period, and the way this has been accomplished and brought about is this: You are very well aware of the debt which the Government owe the Company, and that they were in arrear with the payment. That, in truth, was the only cause why the dividends have not been paid more punctually before. Your Directors have made arrangements with the Government to settle up all the old arrears, and in doing so they have taken bills, accepted by the Government, for the whole of the arrears, covering a period which, under the circumstances and conditions of the finance of the country, is favourable to the Company. They are now bound to pay us 4000 dollars a month—hard dollars—and, so far, this amount has been punctually paid, and there is no reason to doubt that it will be so in future. The trade of the River Plate has been improving for some time, and there is a very marked improvement, particularly in Buenos Ayres, to what it was some ten or twelve months ago; and an improvement taking place up the river is always followed by an improvement down. We may, therefore, look for—indeed, we know, that things have considerably improved in Monte Video, and there is every reason to hope that things will go on improving in future; and, therefore, with these payments and our incoming money at a future time—I do not pretend to prophesy—I hope your dividends will be paid regularly half yearly, and that you will not be obliged to wait. To make this more secure, an arrangement has been entered into with the Government respecting the taxing. That taxing has been



agreed on; and on the 24th of this month we received the following telegram:—"Governor promises tax this month." Now, the Government have been so occupied that the thing was not finally settled as far as the decree went; but the arrangement is made, and, therefore, this will be an additional security to you as to forthcoming dividends being more regularly paid in future. Another point has interfered with the Government—their anxiety and the precautionary measures they are engaged in at the present moment about the yellow fever. That had broken out, and occupied a great deal of their time, and to this is attributed the principal cause of the delay in passing the decree. We know that they are very much occupied, and have a great many difficulties to contend with, and every indulgence and allowance ought to be made. I must say, at the same time, with great confidence, that the President of the Republic has shown himself to be a zealous and true patriot in reducing the charges on the country in every way he could, and in being as punctual as possible in the payments. He is a man highly esteemed, very influential, and has in every way that he could, as far as his means allowed, facilitated the arrangements with this Company. You will see by the accounts that the profits are apparently £8000 less than they were a year before; but this is so far made up in other ways that there is no reason whatever why your dividends should be diminished, and, therefore, we can offer to you, as soon as the money is received, the usual dividend of 4 per cent. for the half year. I now come to a subject that is not quite so agreeable—the disappointment we have in the dock; but this may be easily accounted for, although not satisfactorily, according to our anticipations. The trade in shipping has been so bad, and has fallen off so much, as to interfere very materially with the income of the docks. At the same time, I must say that you cannot take the past year as a fair criterion of what you may hope for in the future. Trade has been very much depressed, shipping has suffered very much also, and, therefore, that accounts for the position of the docks not being so favourable as we anticipated on a former occasion. The revenue of the docks is £500 less than it was a year ago, instead of being, as we ought to look forward to, an increase. I am sorry to say that this is the case. I have one other circumstance to mention, as we always take you fully into our confidence, and withhold no secrets from you connected with the Company. We have had the misfortune to receive a remittance in a bill which has not been honoured. It is a bill for £4000, but we are assured from the other side that there will be a dividend of from 8s. to 10s. in the pound, and that the parties who have failed have very small liabilities, and have assets to make that dividend. There has been a great difficulty in getting good bills, and very few of the banks would draw. All the banks there have been very much crippled, and it has been one of our greatest difficulties to secure good bills for our remittances. I am not aware that there is any other circumstance to bring before your notice, but if any Proprietor has any question to put to me, I shall be very happy to give him all the information in my power. With these remarks, I beg to move—"That the report be received and adopted."

Mr. FREDERICK YOULE, a Director, seconded the resolution.

Mr. MICHELLS said the Shareholders were informed that the Company had received Treasury bills, and it struck him very forcibly that a Company meeting its engagements quickly made it appear really what he considered this was—a strong Company, and on that principle he thought it was the aim of the Shareholders to get the money distributed. One remark which had fallen from the Chairman was not at all surprising to him (the speaker)—he referred to the observation about the dock. He had some knowledge of Buenos Ayres, and when he first embarked in this concern, he made an inquiry of a very clever man, a large merchant, and a resident there, who said, "Condemn the dock," and he had done so. He thought that every trade should be kept to itself. "Let the shoemaker keep to his last." Gas property and dock property were two very different things; and he suggested that if the dock property was worth anything, it should be put in the market. They did not want a dock; they wanted to make profits by one particular thing—by the production of gas. He made these remarks in no captious spirit, but to aid in the government of the Company. He had not differed in his opinion from the beginning—that a dock should never be in the possession of a Gas Company. It had been farmed in some way on the Company, and he contended that they should dispose of it.

Mr. URWICK advocated the separation of the accounts, as to the capital expended on the gas-works and that on the docks, and then they could judge how they were doing. If the dock was useless, the sooner they got rid of it the better. He thought that it was a great misfortune that no dividend had been paid to them. From what he could gather, they ought to have been paid the November dividend. In December, according to the balance-sheet, they had a balance of £9922, and bills in transit £10,000, and that day they were informed that they had Treasury bills on the Government, who had been paying them off at the rate of 4000 dollars a month. He therefore thought that the dividends ought to be paid, so as to maintain their capital. They had been getting gradually worse in the matter of dividends, and he did not like to see his shares gradually going down. Referring to the question of coal in stock, he thought that while coal was cheap they should have a good stock, but he found it had been diminished to the extent of £5000 as compared with December, 1876.

Colonel ROBINSON pointed out that the Chairman had spoken of a dividend of 4 per cent. for the half year, but they were reviewing the accounts of the whole year.

Mr. BYFIELD asked what amount had been received from the private consumption, for some information respecting the taxing to which the Chairman had referred, the amount of profit the Company had received on the working of the dock in the past year, and the amount of Treasury bills received.

The CHAIRMAN, in reply, at the close of the discussion, said the Treasury bills which the Company had received from the Government covered a period of four years. With regard to discounting them, this was a point which would never escape the attention of the Board. They had not only discussed the subject of discounting the bills, but of bringing them to England to discount them. It was a very difficult matter to bring bills of a distant country to discount in London. The rate was so onerous at Monte Video that it really was out of the question to do them there, and, if any, they could only do a portion of them. The rate of interest there for discount would be, at the very least, 12 per cent., so that he thought they would excuse the Directors from incurring such a liability, and particularly when these payments were coming in; and they hoped they would continue to do so, and be punctually paid. The amount of bills received was 190,000 dollars. As to taking nothing but bank bills for remittances, so far from the parties to whom he had alluded being considered of a doubtful character, one of the banks held £23,000 of bills belonging to the house of which this Company had the misfortune to hold one for £4000. This would indicate to them the credit in which the house was held. They could not expect to get scot free in these transactions, considering the times that they had been passing through. This was the first loss they had sustained, and he hoped, now that things were improving, that they would have no more. With regard to the dock, this was a very important matter, on which great stress had been laid. It was only after very grave and mature consideration that the Directors consented to take

it at all, and then at a considerable reduction from the value which was put on it; but the utility of the dock was very great indeed, and without it the Company would have to incur a good deal more expense for coal. Now they had the certainty of discharging and getting their freights lower, and their coal on better terms, than if the dock did not belong to them. The net profit of the dock for the past year was £2600, the item of £4041 in the revenue account being the gross. But the dock formed part and parcel of their property. Its cost, he believed, was £111,000, a good deal of which was invested in machinery, and the net amount realized in the past year would be about 2½ per cent. He should certainly not advise its been sold, and parties well acquainted with the trade of the port would not countenance any such measure. The dock adjoined their works, of which, as he had said, it was part and parcel, and therefore in keeping it along with their gas-works they were "sticking to their last." As to their coal, they had entered into a contract. Those acquainted with a climate such as South America were well aware that large stocks of coal could not be kept without deteriorating very considerably. What they had done to meet this contingency was that they had entered into a contract here for coal to be taken over so many months at a fixed price, which was much better than laying out £30,000 or £40,000 on a large stock of coals, which would be depreciating and deteriorating day by day from the effects of such a climate. This contract was now about to expire, and he need not tell them that this was a very favourable time to enter into a new one. This was now under the consideration of the Board, and it would be a great deal better to make a contract here to cover the requirements of the Company for the next six months than at once send out six months supply. The gross income in the past year from the private consumers was £52,437, and from the public lighting £26,417. The meaning of the taxing was this—it was transferring it from one party to another. Instead of being troubled, and the Government being always in arrear with their payments, it meant that this tax on the Government would be transferred to the consumer, which would make it much more secure to the Company than as it now stood. With regard to Colonel Robinson's remarks, the dividend was divided in the usual way, for the two half years, and there was sufficient to pay at the rate of 8 per cent. for the year.

Mr. MICHELLS said he had not suggested that the bills should be discounted on the other side, for he knew the usurious interest there; but, as they were in possession of the Company, they might be discounted in this country, and he believed they could be done here at no great rate.

The CHAIRMAN said that they would be most happy to offer them to Mr. Micholls on very favourable terms.

Mr. MICHELLS observed that he was not a dealer in bills. With regard to the docks, if it was contended that a dock was a necessary adjunct to a good Gas Company, let them look at the Rio Gas Company, which was admirably well managed, but had no dock. The best way in which to get their coal cheap was not to have a dock, but to go to A., B., or C., and see who would give them the lowest terms. He again urged the advisability of disposing of the dock.

Mr. URWICK repeated that he considered that they ought to have had a dividend, for the accounts showed that they had £19,000 in hand on the 31st of December last.

The CHAIRMAN said the last speaker had looked at only one side of the accounts. The £10,000 on the credit side was in transit, and they had, therefore, taken credit for it in the account, and in anticipation of it had borrowed £14,000 from their bankers. He forgot to mention that Mr. Bartlett James, one of their Directors, and also an old Director of the Rio Gas Company, had gone out to Rio, and he would go down to Monte Video, and see if any improvements and alterations could be made in their Company; and he had no doubt that his services there would be very valuable to them, for he was well known there; he was a man of excellent judgment, and he was thoroughly up in the manufacture of gas from beginning to end. He had no doubt whatever that Mr. James would render an account which would be satisfactory to the Proprietors.

Mr. JAMES agreed in the advisability of purchasing coal here on contract. With regard to the renewal of the contract which they had heard was about to expire, he should be glad to see it renewed, on the present terms, for twelve months. He could quite understand that the possession of the dock gave them advantages which they would not otherwise have.

The CHAIRMAN said that they would make the best arrangement they could in renewing the contract for coal, but there were two parties to every bargain. The Board would be happy to accept a contract for coal for twelve months if they could find a coal proprietor to take it. He thought this matter might be safely left in the hands of the Directors. He then put the motion for the reception and adoption of the report.

Colonel ROBINSON said he objected to the approval of the report, for he saw nothing to approve. They were owed twelve months dividend, and they could get nothing.

The motion was carried with one dissentient.

The CHAIRMAN then moved the re-election as Directors of the Visconde de Mauá and Mr. A. K. Mackinnon.

Mr. YOULE seconded the motion.

Mr. MICHELLS wanted to know whether they were to have the same direction year after year. An infusion of new blood was frequently advantageous.

The CHAIRMAN said the matter was entirely in the hands of the Shareholders, who elected the Directors, and if they did not conduct the business of the Company to the Shareholders satisfaction, and it was their pleasure to put new men on the Board, they could do so whenever they pleased. Although the Directors felt the honour and confidence reposed in them, they would offer no objection to whatever the Shareholders brought forward.

The retiring Directors were duly re-elected.

On the motion of Mr. OHREN, seconded by Mr. J. H. JAMES, the retiring auditors—Messrs. Price, Waterhouse, and Co., and Mr. John Cater—were re-elected.

Mr. CLEMENTS, the Solicitor, in reply to a question, said the Directors had the power to call a meeting at any time, and directly the money was in hand they would call a *pro forma* meeting to declare a dividend.

The CHAIRMAN also said, in reply to the same question, that as soon as ever they received the money, they would call a meeting and pay the Shareholders a dividend.

Mr. BYFIELD then referred to the visit to Rio of Mr. Bartlett James, who intended also to go on to Monte Video. He had no doubt that the visit of that gentleman would be followed by advantageous results.

Mr. J. H. JAMES proposed, and Mr. WIDEKEND seconded, a vote of thanks to the Chairman and Directors, which was passed.

The CHAIRMAN, in reply, said: I beg to offer you my thanks and the thanks of my colleagues for the confidence you have reposed in us. I can assure you that your affairs have had the most careful attention of the Board, and that they will continue to receive them in the future. In a Company like this—indeed, in almost any Company—there may be some matters requiring explanation, and all I can say is that, to the best of our ability, we shall be happy to explain them at any time. Any gentleman wishing information shall have it furnished him, if he will kindly take the trouble to go to the office.

The proceedings then terminated.



## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

With the commencement of this month there has been a drop in prices in the Manchester district, ranging from 6d. to 10d. per ton on all classes of fuel, and generally throughout Lancashire there is a downward movement in values, for, although list rates nominally are unchanged, there is underselling in every direction, and in nearly every case reductions are made rather than miss orders. The gas coal contracts are still competed for at very low figures, and the business doing in this branch of trade is generally of a very unsatisfactory character, so far as colliery proprietors are concerned; but there are some who are holding back in the hope that, as the season advances, and the low sellers have contracted for their output, better prices will be obtainable. Other classes of fuel remain in much the same position as last reported, house coal, steam and forge coal, and engine fuel being very bad to sell, the strike in the cotton trade still throwing large quantities of the last-named description of fuel upon the market. Short time is generally being worked at the pits, and some of them in the neighbourhood of North-East Lancashire are not running more than three days a week. The average quotations at the pit mouth may be given at 9s. to 10s. per ton for good Wigan Arley for house-fire purposes, 7s. 6d. to 8s. 6d. for Arley for gas-making purposes, 6s. to 7s. for common gas coal, 7s. to 8s. for Pemberton four-feet, 5s. to 6s. for forge and steam coal, 4s. to 5s. for burgy, and 3s. to 4s. for slack.

The London and North-Western Railway Company's contracts for Lancashire steam coal for the ensuing twelve months have, I understand, been placed at prices averaging 5s. 6d. per ton at the pit.

The strike of miners in the Oldham district has terminated by the men going in at the reduction in wages.

The iron trade is still without improvement, and there is no material change to notice since last week. There is still very little doing either in raw or finished iron, and prices nominally are unaltered; but there is a great deal of pushing at low figures in the market.

Works are all very slack, and foundries in North-East Lancashire are almost stopped in consequence of the cotton strike.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

Since the prospects of peace have brightened, there has been more activity in shipping movements in the coal trade of the North. All kinds of freights are lower, but the fall has been least in coal freights. To London the rate is 4s. 3d. for steamers, and from 5s. 1½d. to 5s. 3d. for sailing vessels, the latter to deliver coals at the gas wharves below London Bridge; Havre, 6s., steamers; Rouen, 7s. to 7s. 6d.; Dublin, 7s. per ton. In nearly all those quotations the cargoes are gas coals.

The shipments of best gas coals are the ordinary average for the season. About 29,000 chaldrons, a good deal of which would be gas coals, were shipped from the Tyne Dock last week. Best gas coal maintains a rate of about 7s. per ton. Second-class gas are not much in demand. The colliery offices have to make their own bargains, and, as a rule, second-class pits in the county of Durham do not exceed half time. The steam collieries of Northumberland continue to be fairly well employed, but prices are a little weaker. Small coals are at a ridiculously low price. They are delivered free on board ship at the Tyne Dock, at from 2s. 3d. to 2s. 6d. per ton. This, of course, includes railway charges.

The chemical and iron markets were dull during last week. The chemical trade was weaker, and prices, low as they had been previously, tended downward. In the iron market common bars sold at £5 10s.; merchants bars, £9 per ton. In the chemical market crystals of soda were as low as £3 per ton, less 3 per cent. discount. Pig lead was selling at £17; dry white lead at £24; red lead at £18 15s. per ton. Copper, flat cake and ingot, £66 to £68; best selected, £72 per ton.

## TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Dr. Wallace's report on the quality of the Glasgow gas supply for the week ending the 25th of May shows that the minimum illuminating power of the gas ranged from 25.48 candles in the western district, to 26.66 candles in the eastern and central districts, while in no instance did the maximum exceed 27.56 candles, or an average of 26.88 candles. The lowest results over the week were those of the western district.

On the 25th ult. the Glasgow Corporation Water Annuities were higher, at 100 for the £4 distribution, and on Wednesday last they were £1 higher, at 101.

The Perth Corporation Water-Works Commissioners are about to proceed with the execution of the important works provided for by the Act of Parliament obtained last session, including the construction of two large reservoirs (one of which is to be covered), one at the Town's Muir, and the other at Viewlands, and laying down lines of piping, &c.

On Thursday last the town of Bathgate held high holiday, on the occasion of the opening of the new water-works, which have been in progress for some time. In the new works there are embraced a large storage reservoir, capable of containing 105 days supply, being sufficient to guarantee a supply of 80,000 gallons per day; two filters, capable, together, of filtering over 120,000 gallons per day; and a covered tank, capable of holding upwards of 66,000 gallons. Messrs. Leslie, Edinburgh, were the Engineers, and the cost of the whole operations will not exceed the original estimate of £6000.

The Board of Supervision have recommended to the Public Works Loan Commissioners to grant the necessary funds for providing a supply of water to the village of Auchmull, in Aberdeenshire. At one time it was proposed to include the villages of Bankhead and Woodend with that of Auchmull, but there were great difficulties in the way to prevent the proposal being carried out, the chief being the distance between the villages.

An important drainage scheme for the town of Selkirk is at present being carried out, the first portion of which is nearly finished, and the second contract has just been settled. The total cost of both contracts will be about £4000, exclusive of "extras." The sewage is to be used in irrigating a tract of haugh land at the side of the River Ettrick.

A very valuable report upon the disposal of the sewage in various towns throughout England has just been presented to the Barony Patocical Board, the Local Authority for a large portion of the northern suburbs of Glasgow, through which the Possil Burn runs in its course to the Clyde. The reporters recommend that the Board should, in conjunction with the City and other Local Authorities, apply for a suspension of the powers of the Rivers Pollution Prevention Act for a limited period, while they endeavour to agree on a joint scheme for which parliamentary powers may be asked in the next or some early session of Parliament. In the meantime the consideration of the report is delayed.

There was a good deal of improvement in the Glasgow pig iron market during the past week, the closing price on Friday being 8½d. per ton better than on the previous Friday.

The coal market continues to be very dull, and without any notable change or prospect of improvement.

INSTITUTION OF CIVIL ENGINEERS.—At the monthly ballot, on the 28th ult., Mr. Charles Horsley, of Wharf Road, City Road, London, and Mr. John Macnie, of the Londonderry Gas Company, were elected as Associates.

SALES OF PROVINCIAL GAS SHARES.—On Friday, the 24th ult., 105 paid up £25 shares in the Epsom and Ewell Gas Company were sold at the Auction Mart for £3125, or at rather more than £4 15s. per share premium. At the Royal Hotel, Wakefield, on the 31st ult., 120 £5 B-5th shares, fully paid, in the Wakefield Gas Company, sold at £8 and £8 7s. 6d. each.

WATER SUPPLY OF CHRISTCHURCH (N.Z.).—A Committee appointed by the Christchurch (New Zealand) City Council to consider the question of the water supply of the town have agreed to the conditions which the competitive plans for a water supply must fulfil. These conditions are, that every scheme of water supply must provide for a daily consumption of not less than 1,000,000 gallons; that the maximum cost of any scheme must not be more than £100,000; and that the minimum force of water must be equal to throwing a jet of water 100 feet high from a 1-inch pipe. These conditions have still to be submitted to the Christchurch City Council for approval.

LIVERPOOL GAS-FITTINGS COMPANY.—The annual meeting was held on the 21st inst.—Mr. Thompson in the chair. The report of the Directors stated that the profit on the year's working was £1021 13s. 2d., which added to the sum of £636 4s. 9d., the balance from last year, left the sum of £1657 17s. 11d. to the credit of profit and loss account. The Directors recommended that a dividend be declared for the year, at the rate of 10 per cent. (free of income-tax), leaving a balance of £657 17s. 11d. to be carried forward to next year's account. The report was adopted, and the dividend declared. Votes of thanks were passed to the Directors, and also to the Secretary and Manager, Mr. S. Haynes.

RIVERS POLLUTION ACT.—In the St. Albans County Court, on the 17th ult., the case of *Woolam v. The Corporation of St. Albans*, for polluting the River Ver, came again before Judge Wigham in the form of an application made by Mr. Dunville, Deputy Clerk of the Peace for Hertfordshire, on behalf of the plaintiff, for an order that defendants should pay £50 a day for every day during which the defendants were in default in complying with the requirement of the order of the court dated Oct. 26, 1877. At the April sitting a further extension of time for six months was allowed, but to this the plaintiff now objected, and asked for the imposition of a fine within two months. The Judge imposed a fine of £25, but gave liberty to the defendants to apply for rescindment on the 9th of August, on proof being given that all due care and despatch have been used in the preparation of a scheme to prevent continuation of the offence, and that such scheme will be carried out without delay.

MILTON NEXT SITTINGBOURNE GAS SUPPLY.—At the meeting of the Milton Improvement Commissioners on the 8th inst., a report was read from Mr. Pike, Manager of the gas works, showing the increase in the manufacture of gas. From this it appeared that the amount of gas made in the year 1877-8 was 4,608,600 cubic feet, against 2,946,900 in 1876-7; coal used, 558½ against 360; tons; lime used, 39 against 26 loads; coke sold, 152 against 136 chaldrons; tar sold, 87 against 62 barrels; public lamps lighted, 1497½ hours against 1666 hours; amount paid in wages, £240 8s. 3½d. against £179 11s. 6d. During the week ending April 29, 1878, 81,000 cubic feet of gas were made, against 42,700 in the corresponding week of the previous year. The Manager added that if the increase still continued something would have to be done to meet the wants of the consumers. The question of extending the gas-works was referred to the Gas Committee, to consider and to report upon at a future meeting.

EPSOM AND EWELL GAS COMPANY.—The *Sutton and Epsom Advertiser* says "The works of this Company have been for two years under the management of Mr. Robert Jones, C.E., Engineer to the Commercial Gas Company, and a Member of the Metropolitan Board of Works, assisted by his son, Mr. H. E. Jones, C.E., also of the Commercial; and the Directors and their Chairman, J. H. Puleston, Esq., M.P., may, we think, congratulate themselves and the proprietary on the conversion of a property, which a short time ago paid no dividend, into one of the value evidenced by the prices realized at the late sale. The price of gas per 1000 is now 5s. 10d. The property having so considerably increased in value, it would be well if the Managers could see their way to allowing the consumers to participate in the benefit by lowering the price of gas. We understand that there is some probability that this determination will be arrived at. It will tend not only to gratify the consumers, but will probably prove financially advantageous to the Company."

DRONFIELD GAS COMPANY.—At the annual meeting on the 22nd ult., the Directors reported the continued success of the Company. There had been laid 720 yards of new mains during the last year, and 200 yards more were awaiting the permission of the Local Board to be laid. The leakage had again occupied the attention of the Directors, and after much anxiety and expense they had been able to reduce the waste from 35 to nearly 10 per cent. The Directors were glad to be able to intimate that they had reduced the price of gas 10d. per 1000 cubic feet, and, at the same time, added 28 consumers to the list of customers. They hoped that during the coming year the public of Dronfield would avail themselves of the privilege of using gas more generally, so as to enable the Directors to still further reduce the price to the consumers. The 800 new £15 shares (equal to £12,000) of 1877 had all been issued. Should the public require further extensions, another call would be necessary, to enable the Directors to meet the wishes of the inhabitants.

QUALITY OF THE NEWCASTLE-ON-TYNE GAS.—Mr. John Pattinson reports the following as the results of his examinations, for the last month, of the quality of the gas supplied to the borough by the Newcastle-on-Tyne and Gateshead Gas Company:—

Date, 1878.	Illuminating Power in Sperm Candles.	Grains of Sulphur in 100 Cubic Feet of Gas.	Sulphuretted Hydrogen.
May 3 . . .	14.0 . . .	6.34 . . .	Nil.
" 7 . . .	15.4 . . .	5.82 . . .	"
" 10 . . .	14.8 . . .	5.74 . . .	"
" 14 . . .	15.7 . . .	5.73 . . .	"
" 17 . . .	15.2 . . .	6.00 . . .	"
" 21 . . .	15.4 . . .	5.94 . . .	"
" 24 . . .	15.4 . . .	5.05 . . .	"
" 28 . . .	15.0 . . .	6.32 . . .	"
" 31 . . .	14.9 . . .	6.54 . . .	"

A Sugg-Letheby standard Argand burner and Wright's sulphur apparatus are used in testing. According to Act of Parliament, the gas should not be of less than 14 standard candles illuminating power, nor contain more than 17 grains of sulphur per 100 cubic feet of gas.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.—On Saturday, the 26th ult., the Members of this Institution, to the number of 80, paid a visit to Blackpool, and were received at the Corporation Gas-Works by Mr. Anderson, the Deputy-Chairman of the Gas Committee, and Mr. Chew, the Engineer, and conducted to the committee-room, where the drawings of the new works recently completed, and those now in progress, were arranged on the walls for their inspection. These works consist of



a set of six annular condensers, each 20 feet by 2 feet 9 inches; a pair of scrubbers, each 5 feet by 35 feet, adapted for ammoniacal liquor and fresh water respectively; a gasholder and tank, 80 feet by 20 feet, to hold 100,000 feet of gas; a gasholder and tank, 101 feet by 26 feet, to hold 210,000 feet of gas; with all the details of working drawings; and a new retort-house, with coal sidings and sheds, 140 feet by 60 feet, capable of holding 168 mouthpieces. The whole were critically examined by the various Engineers present, after which a general inspection of the works was made, including the apparatus for the manufacture of sulphate of ammonia and the distillation of tar. Many inquiries were made from Mr. Chew in reference to various parts of the plant, and much interest and satisfaction was expressed by the Engineers present.

**STEALING IRON FROM THE HALIFAX CORPORATION GAS-WORKS.**—Three men—father and two sons—Jonathan, Samuel, and Frank Hainsworth, have been committed for trial by the Borough Magistrates, charged with stealing iron from the Halifax Corporation Gas-Works. The case against Samuel Hainsworth was heard first, the charge against him being that of stealing two bags of bolts and an iron elbow. The circumstances were these: The Gas-Works Committee accepted a tender sent in by the father for old iron at the works. This was to be weighed on being removed. Samuel Hainsworth caused the things mentioned to be removed in a cart which had taken bricks to the works, and they were not weighed. The bolts were among the things contracted for, but the iron elbow was not. The act was observed, and the carter was stopped before he had got far from the works. Prisoner was committed to the sessions, but bail was accepted, himself in £80, and two sureties in £30 each. All the three prisoners were then placed in the dock, Samuel and Frank for stealing, and their father, Jonathan, for receiving iron on the 3rd, 7th, and 8th of May. The chief witness was William Reed, a labourer, who, along with Samuel and Frank, helped to remove the iron from the gas-works to Hainsworth's yard, without it being weighed. Jonathan Hainsworth was present in the yard, it was proved, when the iron was being broken up. Prisoners were all committed for trial, but were admitted to bail, Samuel in his own surety of £80, and two others of £30 each; and the other prisoners each in £100, and two sureties of £50 each.

**HIGHBRIDGE GAS-WORKS.**—These works, which have just been completed at a cost of £3500 were opened a week or two ago, and the event was celebrated by a public dinner and a great display of rejoicing throughout the town. The necessity of providing gas-works for Highbridge was long since talked of, and a Company was formed for the purpose eight years ago. The protracted delay which has since taken place is accounted for by the difficulties that have presented themselves with regard to the selection of a site, two which were purchased having been strongly objected to, on various grounds, and abandoned. This matter, however, having been overcome, the services of Mr. Dand, C.E., of Exeter, were called into requisition, and that gentleman's plans, &c., accepted, and Messrs. Willey and Co., of Exeter, were employed to carry out the engineering portion of the work, the contract for the building having been entered into with Mr. Press, of Burnham. The manner in which the works were planned and have been executed reflects great credit on all concerned, and several competent judges have pronounced them to be everything that can be desired. The works comprise ten retorts with 4-inch pipe connections; two condensers, 2 feet diameter by 10 feet; scrubber, 4½ feet by 12 feet; two purifiers, with 4-inch connections; and gasholder 40 feet diameter by 12 feet deep, with six columns and ornamental girders. The inlets and outlets of the gasholder are all 9-inch, whilst the delivery-pipe to the town is 6-inch. The meter and governor have also 6-inch connections. The buildings are of brick, with tile roofing—namely, retort-house, purifying and lime shed, and model-house. A commodious brick house has also been erected upon the premises for the Manager. In the evening of the day on which the works were opened the town was effectively illuminated.

**LANDING AND STORAGE OF PETROLEUM.**—At a meeting of the Civil and Mechanical Engineers Society on the 2nd of May—Mr. Henry Valpy, Memb. Inst. C.E., in the chair—a paper was read by Mr. William C. Street, Assoc. Inst. C.E., on "A Landing Pier and Concrete Warehouses at Thames Haven." The Thames Conservancy having prohibited the discharge of any oil giving off vapour under 100° Fahr., nearer London than Thames Haven, and the Metropolitan Board of Works having on more than one occasion referred to the danger occasioned to the inhabitants of the Metropolis by the storage within its area of, on the average, over 50,000 barrels of petroleum, a Company was formed about two years ago for building warehouses with landing conveniences and railway communication at Thames Haven. The pier extends into the river about 250 feet, and there is a depth of water at low water spring tides of about 25 feet. The pier head is an iron structure 90 feet long by 30 feet wide, with every convenience for landing, and with rails laid upon it, having direct communication with the London, Tilbury, and Southend Railway, as well as to the warehouses. These last are 13 large concrete vaults, each 90 feet long by 20 feet wide, and 14 feet high, and capable of receiving about 1500 barrels each. These are considered as only a commencement, the intention being to build a much larger number, as the advantages offered are appreciated and the trade increases. The author described the details of the several works and the difficulties encountered in their construction. The Contractor was Mr. William Eckersley, Memb. Inst. C.E., and the works were executed under the superintendence of Mr. Brunlees, Vice-President of the Institution of Civil Engineers, as Consulting Engineer; Mr. Henry William Spratt, as Architect; and of the author of the paper (Mr. William Street) as Acting Engineer. An interesting discussion followed the reading of the paper, in which the President, Mr. H. E. Hill, Mr. R. M. Bancroft, Mr. A. F. E. Grant, Mr. James Love, Mr. George Luffkin, and other gentlemen took part; and Mr. Street replied to some important questions regarding the employment of concrete, the construction of the pier, and the mode in which the difficulties encountered in the work were overcome. A vote of thanks was accorded to Mr. Street for his paper.

**ENGLISH COAL MINING.**—A recently published Blue Book contains the reports made to the Home Office by Her Majesty's Inspectors of Mines, in pursuance of the Coal Mines Regulation Act. Accompanying these reports are summaries of the statistics for the twelve districts inspected, showing

the aggregate number of persons employed, during the year, above and below ground in the coal, fire-clay, ironstone, and shale mines of Great Britain and Ireland. The first summary shows the number and ages of the male persons employed both above and below ground, and also the number and ages of the females employed above ground, together with the quantity of mineral raised in each of the twelve inspection districts. It appears that in the aggregate 494,391 persons were employed in and about the mines already mentioned. Of this number 395,025 were employed underground, and 99,366 (of whom 5378 were females) employed above ground; thus showing, as compared with the respective numbers employed during the year 1876, a decrease of 20,141—namely, 19,464 males and 677 females. The second summary gives the mining produce either in districts or counties, by which it appears that 134,179,968 tons of coal, 1,813,541 tons of fire-clay, 12,014,356 tons of ironstone, and 838,395 tons of shale, &c., were produced in the mines classed under the Coal Mines Regulation Act, including the quantity of iron pyrites, &c., found in working these mines, which is separately given in the respective districts to which the latter remarks apply. Comparing the above quantities with the output of 1876, an increase is shown in coal of 54,802 tons; fire-clay, a decrease of 258,442 tons; ironstone a decrease of 145,224 tons; and an increase of 205,730 tons in the quantity of shale, &c. Summary No. 3 contains an account of fatal accidents and lives lost during the year 1877 in and about all the mines coming within the scope of the Coal Mines Regulation Act. The fatal accidents amounted to 864, and the deaths occasioned thereby reached 1208, showing an increase, when compared with the summary of 1876, of 25 in the number of fatal accidents, and 275 in the number of lives lost. No. 4, the last of the summaries classed under this Act, shows the proportion which the accidents and deaths bear to the number of persons employed and the quantity of mineral raised. It appears that, on the average during the year under review, there was one fatal accident among every 572 persons employed in and about the mines, and one death by accident among every 409 persons employed; and that for each fatal accident 172,276 tons of mineral were got, and 123,217 tons for each death by accident. During the year 1876, of every 613 persons employed there was one fatal accident, and for every death by accident 551 persons were employed. For the year 1877, one accident has to be recorded for every 572 persons employed, and one death for every 409 persons employed. In 1876 the larger quantity of 177,580 tons of mineral were wrought per accident, and the larger quantity of 159,688 tons per death. In giving a synopsis of the summaries, and, after making comparison with those of the preceding year, it should be stated that, while the returns show a diminution in the number of persons employed, there was also a decrease of 154 mines at work, and that the quantity of mineral raised is smaller than that of 1876 by 143,125 tons.

## Register of New Patents.

### APPLICATIONS FOR LETTERS PATENT.

- 2028.—BENNETT, P. D., Birmingham, "Improvements in apparatus employed in the purification of coal gas." May 21, 1878.  
 2037.—CLAYTON, S., Bradford, "Improvements in gas motor-engines, and in apparatus connected therewith." May 22, 1878.  
 2069.—RIPLEY, R. S., Strand, "Improvements in the process and apparatus for the manufacture of gas for heating and other purposes." A communication. (Complete specification.) May 23, 1878.  
 2070.—LAKE, W. R., Southampton Buildings, London, "Improvements in water-meters." A communication. May 23, 1878.  
 2090.—LAKE, W. R., Southampton Buildings, London, "An improved gas and water meter." A communication. May 24, 1878.  
 2095.—CLARK, A. M., Chancery Lane, London, "An improved apparatus and process for manufacturing illuminating gas." A communication. May 24, 1878.  
 2103.—GENT, J. S., Manchester, "Improvements in gas-burners." May 25, 1878.  
 2106.—MARTIN, R., Howham, Sussex, "Improvements in the manufacture of gas, and apparatus suitable thereto." May 27, 1878.  
 2168.—GOODALL, F., jun., Marsden, Yorks, "A new or improved union or joint for pipes, and in washers for the same." May 30, 1878.

### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 4454.—JUSTICE, P. S., Southampton Buildings, London, "A new combined tap and faucet." A communication. Nov. 27, 1877.  
 4576.—HILTON, M., Prestwich, Lancs, "Improvements in the manufacture of gas." Dec. 3, 1877.  
 314.—WILSON, W. V., Mile End, London, "Improvements in the manufacture of cyanogen products from gas residues." Jan. 24, 1878.  
 1299.—CLARK, A. M., Chancery Lane, London, "An improved gas lighter." A communication. April 2, 1878.

### NOTICE OF APPLICATION FOR LEAVE TO FILE A DISCLAIMER AND MEMORANDUM OF ALTERATION.

- 3101.—MEWBURN, J. C., Fleet Street, London, "Improvements in lighting railway carriages with gas, and in the apparatus employed therein." A communication. Sept. 22, 1873.

### PATENTS WHICH HAVE BECOME VOID.

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.  
 1790.—JAMESON, J., and SCHAEFFER, A. G., "Improvements in centrifugal pumps." May 13, 1875.  
 1816.—WALLACE, J., "A new and improved pump for pumping water, air, or gases." May 15, 1875.

## TO GAS ENGINEERS.

### D. BRUCE PEEBLES & CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

## TAY WORKS, BONNINGTON, EDINBURGH.



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## TO CORRESPONDENTS.

*INQUIRER.—A Provisional Order under the Gas and Water Works Facilities Acts incorporates the Gas-Works Clauses Acts, 1847 and 1871, but not necessarily the Companies Clauses Act; and where it does not, the accounts of the Company may be balanced, and dividends paid, yearly or half yearly, at the option of the Directors, or as may be agreed upon by the Shareholders in general meeting.*

## THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 11, 1878.

## Circular to Gas Companies.

ABOUT the practical value of exhibitions of gas apparatuses, in popularizing the use of gas, we have no doubt whatever. The results may not be immediately apparent, but we make little question that at South Shields the use of gas has already been extended since the exhibition projected by the Gas Company. In this Metropolis we experience a difficulty. In many of our leading thoroughfares apparatuses for the consumption of gas for culinary and heating purposes are to be found in shops; but these expositions do not bring the actual value of the apparatus home to the gazer's mind. Explanation and demonstration are wanted, and this the shopkeeper does not always afford. Thus possibly a gas exhibition of a popular character might prove of use even in this vast Metropolis. We do not, of course, forget that a very fair collection of cooking and heating apparatuses was exhibited in one of the abortive displays that have taken place at South Kensington. Naturally but little attention was paid to it, and, so far as the interests of Gas Companies were concerned, the exhibition fell flat. Exhibitors were disappointed, and we question whether Gas Companies profited. We hesitate to suggest a Metropolitan exhibition; but every Gas Company might, perhaps, do something for themselves. Not only gas is to be thought of, but the consumption of coke as well. We may have entered upon a cycle in which warm winters will prevail for many years to come; but coke must be got rid of in some way or other, and in winter, warm or not, people like to have a cheerful fire. Thus it is to the interest of Gas Companies first of all to promote the sale of their finished product, and then to dispose of their chief residual.

Whatever may be the financial results of the Exhibition of Gas Apparatus just brought together by the Corporation of Birmingham, there is no question that, as a display, it was a great and complete success. We leave our Special Correspondent to deal with the details of the exhibits, and here simply give a general view of the entire collection. All the leading manufacturers of apparatuses for the use of gas, other than for illuminating purposes, were well represented, but it is needless to say that cooking-stoves were in the majority. Of these we had every variety, from a range adapted for a nobleman's mansion, or a large hotel, down to the inexpensive apparatus, by means of which a provident artizan could do all the cooking necessary for his family at an expense of about three-halfpence per day. The dingy Town Hall, looking perhaps dingier than ever, was not made brilliant by the display, and a strong smell of half-burnt gas, and more than half-burnt fat, resulting from the meat-bakings going on, did not add to the attraction. Burnt fat, however, is the inseparable accompaniment of baking and roasting operations. We have, perhaps, hypercritical olfactory nerves, but we do wish that manufacturers would arrange for an adequate supply of air to their mixed flames, for the smaller apparatuses are used in close rooms, where the stench of acetylene would be unbearable. But, after all, the cooking apparatuses formed a noble display, highly creditable to the manufacturers, and destined, we believe, to greatly increase the consumption of gas. Other useful inventions were not omitted. The poor laundress could have seen cheap apparatuses for warming flat-irons, and the solderer for his copper-bits. Lacquering-stoves were well represented. Gas-engines did not form so prominent a part of the display as we could have wished in such a place as Birmingham, but several found a place in the exhibition. Cheerful heating-stoves and coke-stoves were, of course, abundant, and will, no doubt, receive the full attention of our reporter. Passing to the gallery, we found many objects of interest. There was a splendid display of gas-burners, which, however, required fuller explanation than was vouchsafed to us. The Birmingham public, an examination of the shop windows showed us, require instruction in the use of burners. We saw fishtails burning jet fashion, and bat's-wings showing two horns of flame, which suggested to us that the Corporation might have an energetic Inspector or two to teach shop-keepers how to keep their burners in order. Among other objects of interest was a very complete display of residuals, and products manufactured therefrom, collected by the Gas Engineers. Pressed into the service was the pile microphone, which found its place there by virtue of the plate of coke used in the battery; and that reminds us to ask what electricians will do for the dense coke they require when anti-dip pipes and improved exhausters have completely prevented the deposition of carbon in retorts. We may end this notice here with the remark, that the Corporation deserve the thanks of their customers and the public generally, for affording them this opportunity of becoming better acquainted with the uses of gas. We hope manufacturers will profit by it; but we are sorry to say that, on the two high-priced days, the Exhibition was not so well attended as we could have wished to see it. Whether the artizan class availed themselves of the cheaper rates, we shall learn in due time from our special reporter.

As there is a great Exhibition in Paris, Directors of Gas Companies and Gas Committees of Corporations have been smitten with the idea that they might learn something by a visit to the Paris Gas-Works. There is, indeed, a good deal to be learnt by a visit to those works, but not by a walk round, occupying, perhaps, not more than a couple of hours. Among others who have thought this a convenient time for gathering information in the French capital were the Gas Committee of the Corporation of Manchester, whose stay must have been short, or their wants moderate, for their trip only cost the ratepayers £200. Let us hope that the Committee will be liberal to their Gas Managers, and allow them sufficient time and money to attend the forthcoming meetings of the British Association, and also to pay a serviceable visit to Paris. The moment is made opportune by the meeting of the Société Technique, and we hope that Corporations and Companies will alike allow their officers time and means for a visit.

The wild scheme for the manufacture of illuminating gas from sewage is, it would appear, to receive an extended trial at Worcester, the Corporation of which city have granted to the inventor of the process as much sewage as he may choose to take for his purpose. We are, of course, not at all sorry to learn that a trial is to be made on a larger scale, and if it should succeed, we shall not in the least envy Mr. Stephan. Cheap and good gas would be such an immense boon to the whole community, that, let it come from what source it may, it must be welcome.



We believe it will continue to come from coal, and will never cost much less than it does at present; but we shall see.

The subject of commissions has dropped out of notice for some time; but, so far as Gas Managers are concerned, it is revived in a letter which we publish in another column. The point, which arose in a trial that took place in the Queen's Bench Division of the High Court of Justice, was the legality of the acceptance by an Engineer employed by one party, of a commission from another party doing contract work for his employers, under his superintendence. The Court ruled that receiving what are practically bribes was at once illegal and immoral, and the Judges expressed their opinion in very emphatic terms. Our readers know what our ideas on the subject are. We have never attempted to justify the practice of taking commissions, but we have pointed out that, while Gas Managers continue to be paid such miserably small salaries, the temptations to accept commissions on whatever is bought must be exceedingly strong. After all, a manufacturer who offers the bribe must be considered the more blameworthy party; but, in these days of fierce competition, there is even an excuse for him. Let us hope that, as time rolls on, better principles will prevail; that Gas Companies and Corporations will pay their officers more liberally, and these latter will cease to be tempted.

Carbonic acid is certainly not a statutory impurity in gas; but its presence therein is so prejudicial to the interests of a Gas Company, that every care is taken to remove as much of it as possible. A little, however, generally passes on, and whatever injury it may do is, as we have said, a prejudice to the Gas Company. The quixotic Medical Officer of Health to the Chelsea Vestry finds grave fault with the London Company for allowing the presence of a small per centage of carbonic acid. The fact, nevertheless, remains, that the public in that Company's district are supplied with much richer gas than is required by statute. Medical Officers, however, must do something for their money, and we suppose it is their especial business to find grievances, and, if necessary, to make them. It should be mentioned, that the Vestry have instructed their Solicitor to have the gas-works at Fulham watched for the next three months. What this sort of *espionage* costs the ratepayers we are unable to say; but, whether the sum be great or small, we are perfectly certain that no adequate benefit results from the expenditure.

After a great deal of discussion, the Town Council of Rochdale have agreed, by a considerable majority, to increase the salary of their Gas Manager. The motion was, of course, opposed; for there are severe economists in the Council—men who evidently think that a Gas Manager's remuneration should be kept as low as possible. However, as more than the £100 a year is to be saved by altering the remuneration of the lamplighters, the opposition was not very strong.

The Town Council of Hereford have also had before them the question of an increase in their Gas Manager's salary, and also an application for extra remuneration while the new works are being constructed. The Council declined to raise his salary, but agreed to pay the Manager a commission of two and a half per cent. upon the outlay on the new works. As from £20,000 to £30,000 will be expended in this direction during the next five years, a comfortable addition will be made to his income.

In the Halifax Town Council the same question has cropped up, it having been proposed to raise the Gas Manager's salary to £400 a year. Here, as usual, the hard-headed and harder-fisted Yorkshireman turned up, who thinks it is always inopportune to raise salaries, seeing that large salaries generally prove the ruin of their recipients. However, a sufficient number of Councillors were more generously disposed, and the increase was carried. Thus we are happy to say that some Managers will be able to come up to the Association meeting with heavier purses and lighter hearts than usual. But really, on reading some of these Town Council discussions, we wonder that any man of honour, skill, and experience can be persuaded to serve a Corporation.

### Water and Sanitary Notes.

THE Thirlmere Scheme is beyond doubt shelved for the present session; but it will be revived in the next, with, we fear, no increased prospects of success. What alterations the Water Committee of the Corporation of Manchester may see fit to introduce into the Bill we cannot say; but we hope it will be presented much in the form into which it was moulded by the Select Committee of the House of Commons. We think it important that provision should be made for the supply of towns along the line of aqueduct, and cannot understand the objections raised to this by the opponents of the scheme in the Manchester Town Council. The great store of water in our northern lakes

belongs, it may be said, to the whole country, and to give any one city or district a monopoly of it would be a great injustice. We still hope to see the scheme carried out, but confess to a fear that there is in the House of Lords an opposing party of great influence.

The South Kensington clique mustered strong at Stafford House on the 3rd inst., in order to give Major—we beg his pardon—General Scott (men get on so fast in the army, when they have civil employment and never see a shot fired, that it is difficult to keep up with the promotions) one more puff. He is now at Burnley, professedly converting the sludge of sewage clarified with lime into something which, by a figure of speech, perhaps, is called Portland and Roman cement. The scheme was tried at Birmingham, we believe, under the personal superintendence of Sir Henry Cole, C.B., who was the oracle at Stafford House the other day; but we have not yet heard how many tons of cement were made at Birmingham, nor what was the quality of it when produced. We have met with specimens of sewage cement, and found that when made into blocks it had, as an eminent engineer said, the strength of oat cake. The sale of a few tons of cement of such quality as would be of any use to a builder or a contractor would do more to promote the use of General Scott's process than any number of Stafford House meetings, and exhibitions of sewage sludge by Sir Henry Cole, C.B. We fear that at present Local Authorities cannot be advised to adopt this plan for treating their sewage; for, so far, it has produced no profitable results. The clarification of sewage by lime is a very old invention; it was tried on a large scale by Mr. Wicksteed, at Leicester, but he could make nothing of his dried residue. Perhaps sewage cement and sewage gas may be put in the same category.

Whatever profit may result to Burnley from the adoption of the Scott process, the choice between cement manufacture and sewage farming, so far as making profit is concerned, is not very great. In these days, however, it is fully admitted that the material, which was once seriously regarded as a mine of wealth, is now a substance which ratepayers must be content to pay to get rid of. West Derby has a sewage farm, out of which it once fondly dreamed of getting a good revenue. It has, however, sadly disappointed the hopes of its projectors. More and more money is expended every year on works, but the farm cannot be made to pay its expenses. It seems in past times to have been rather badly managed; but, even at the best, the result was far from what was expected. The West Derby people are no worse off than the majority of Local Authorities who have sewage farms. There are, however, believers firm in the faith that sewage farms will ultimately be made sources of profit. Among these is Mr. Donaldson, M.A., who recently read a paper to the Members of the Sanitary Institute of Great Britain. He says, with perfect truth, that irrigation offers the best means of purifying sewage—that is, we may add, if it be properly carried out, and the water be passed through the land, and not simply over it.

That no chemical process completely purifies sewage, every one is fully aware; but still, it is not always possible to irrigate, and a chemical method may be employed to bring the sewage into a condition which will justify its admission into a stream. It is true that chemical treatment has always entailed a loss, and will probably continue to do so until some happy chemist discovers a cheap precipitant of dilute ammonia and phosphates.

Lord Redesdale has been dealing with the Cardiff Water Bill with rather a high hand. The measure came before his lordship unopposed; but, though not objected to by the Cardiff Corporation, it did not meet Earl Redesdale's views. It is, among other things, to sanction an arrangement entered into by the Corporation with the Water Company for the transfer of the undertaking of the latter. In Lord Redesdale's opinion, however, the terms agreed upon are too high, and on that account he hesitates to pass the measure. Surely the powers of a Chairman of Committees are being somewhat overstrained when he objects to pass a private Bill which all the parties concerned assent to.

The Liverpool Land and House Owners Association are naturally alarmed at many of the provisions of the Public Health Bill, which, if arbitrarily carried out, will render some lands, and also house property, unless of good description, a very undesirable form of investment. The Sanitary Acts at the present time press very hard upon the houseowner. The Public Health Act, which will require a landlord in a rural district to obtain for his tenant a supply of pure-water, which, it may be, could only be procured at great expense, may ruin not a few of the owners of cottage property in the kingdom. We are, therefore, not surprised that the Liverpool Association of House Owners have taken action, and petitioned the Lords against the Bill. Parliament would have been inundated with petitions from all parts of the country,



but for the fact that most of those whose interests are concerned have heard nothing of the measure.

We conclude to-day our report of the proceedings before the Select Committee of the House of Commons on the Nottingham Water Bill. These present some points of much interest. Mr. Michael, Q.C., who succeeded in getting auction clauses inserted in the Bill of the Grand Junction Company, tried hard in the case of the Nottingham Company to persuade the Committee that such clauses were scarcely admissible into a Water Bill, but he was not successful in carrying his point. The Company failed in another matter, and that was the amount of new capital to be allowed. Upon all other questions in dispute the Company must be considered to have triumphed, as they deserved, for the Corporation could allege no complaint against them. The Company have now a new lease of life, and that is all we care about.

There seems to be a question at Henley-on-Thames whether water-works shall be constructed by the Local Board or by a private Company. Alarmed by a resolution of the Local Board, which committed them to make and maintain water-works, a meeting of the inhabitants was called, at which, as we read the report, the proposition of the Board was unanimously condemned. We are afraid that, as a matter of fact, the water supply of Henley is not particularly good; it comes, for the most part, from shallow wells, which are often seriously polluted—that is, in the opinion of modern sanitarians. Henley is, however, a very healthy place notwithstanding; still a liberal supply of pure water would be a blessing, even in that cheerful little town. But then comes the bugbear—water-works established, sewerage works must, in some people's opinion, follow. What come after them every ratepayer knows—a mountain of debt and rates proportionate. It does not follow that sewerage works should be the inevitable accompaniment of water-works. If the inhabitants will abstain from water-closets, they may get rid of their refuse water by channels cheaply constructed, the contents of which, at Henley, might be at once discharged into the river without offence. We advise the ratepayers to allow the Company to proceed, and leave the Local Board to attend to their own particular functions. A Company can only charge the inhabitants for the water supplied, and no one is compelled to take it; but under the Public Health Act, any Local Authority may compel a consumer to take the water supplied by such authority, who may charge practically what they please for it, and then levy rates to make up deficiencies.

#### EXHIBITION OF GAS-STOVES AND HEATING APPLIANCES AT THE TOWN HALL, BIRMINGHAM.

Since the collection of gas apparatus exhibited under the auspices of the Gas-Fitters Association in 1851, at the Polytechnic Institution, London, no display of the kind has taken place approaching in completeness the assortment which has been on view at the Town Hall, Birmingham, during the last few days, and great praise is due to the various manufacturers for the hearty manner in which they responded to the invitation of the Gas Committee of the Corporation. The articles exhibited and intended for competition comprised eleven distinct classes, of which seven were devoted to cooking stoves, the remaining four including baths, heating stoves, appliances for general and trade purposes, steam-boilers and engines actuated by gas, and stoves for the use of coke as fuel.

The bulk of these exhibits occupied the floor of the great hall and the adjoining corridors. In the galleries were arranged a variety of meters, burners, test-gasholders, models of gas-works, specimens of products derived from the residuals, and other objects and appliances connected with the manufacture and use of gas. But the main object of the Committee in organizing the exhibition, was to bring together all the apparatus connected with gas, as applied to cooking, heating, and ventilation, and as a source of heat for manufacturing purposes, and the award of prizes was restricted entirely to the articles exhibited within these limits.

Commencing with the section devoted to cooking, the principal exhibitors were Messrs. Billing and Co., of London; Hassall and Singleton, of Birmingham; Leoni and Co., of London; W. H. Marklew, of Birmingham; Davis and Son, of Bath; T. Nock, of Birmingham; J. E. Prust, of Birmingham; Scott, Brown, and Co., of West Bromwich; Chas. Wilson, of Leeds; J. Williamson, of London; and J. Wright and Co., of Birmingham. There were also a number of other manufacturers.

The mode of applying the heat in the stoves and ranges may be divided into two classes. As regards the roasting chambers, in one class the heat was reflected from above on to the meat below. In using the gas in this manner, although the cooking process appears to be effected in a satisfactory manner, still, to secure the necessary uniformity of colour and browning, the joint has to be turned over very frequently, and needs basting, which requires the attention of the cook. In the other class of stoves, where the burner is placed at the bottom of the chamber, and the joint suspended above, it is completely enveloped in an atmosphere of heated air, and every part of the meat is exposed to the same temperature at the same time.

This arrangement seems to comply more effectively with the requirements of perfect and uniform roasting than where the heat is reflected upon only one side of the meat at a time.

It must, however, be admitted that the reflecting stove has the advantage of using the heat more advantageously for baking purposes, as the pastry or other viands intended to be baked are placed in a separate chamber, and are very efficiently cooked; but in cases where it is desired to roast only, or to bake only, there is no question that the enclosed stove, heated by a single burner below, is the most perfect mode of using the gas, and, at the same time, the most effective as a cooking agent.

The system under which the gas was burnt varied considerably. In some stoves pure gas was used; in others an admixture of air and gas was adopted. It is obvious that in the latter arrangement great attention is necessary to secure a proper admixture, and in cases where reduced heat or small consumption is only required, the burners employed with the aerated gas are not so manageable as those in which pure gas is used. The chief recommendation of the mixed air and gas system is its cleanliness. Some of the stoves for boiling and frying were upon a new system of construction, so arranged as to heat the gas to a very high temperature before mixing it with the air, and before its ignition. The advocates of this arrangement claim for it greater economy in the quantity of gas consumed and a higher heating power, but it is very questionable if these advantages are not more apparent than real, as the actual heating effect can only be in accordance with the weight of the material burnt, irrespective of its volume or bulk; or, in other words, the true calorific effect is represented by the amount of hydrogen converted into aqueous vapour, and carbon into carbonic acid.

Before dismissing the cooking-stoves, it may be desirable to point out the tendency there is on the part of some manufacturers to contract the size of their stoves by crowding into a small space too many separate ovens or hot closets. This is an error. English families of the lower and middle classes generally make a single joint the chief feature of their every-day dinner, and only look upon *entrées* or pastry as adjuncts; therefore, be it an open grate, a close oven, or a gas-stove, either is only suitable when it is large enough to cook the family joint. Many of the gas-stoves at Birmingham, although displaying great ingenuity in the arrangement of their several parts, were still defective, because the roasting chamber was too small, its space having been contracted in order to provide a separate oven or a hot closet.

The stoves exhibited in Classes 1 and 2, by Messrs. J. Wright and Co., Leoni and Co., C. Wilson, and Davis and Son, were good examples of stoves, where simple roasting or baking and boiling are the chief features of the cooking requirements of an ordinary English family. For those who require more elaborate culinary arrangements, some stoves exhibited by Messrs. Billing and Co., Scott, Brown, and Co., and Wright and Co., deserve special commendation for their general arrangement, excellence of workmanship, and moderate price. In complete kitcheners, the gas-cooking range of Mr. C. Wilson, of Leeds, was an excellent specimen of the class, and perfectly adapted to the requirements of a large family, or boarding school. A large kitchener, exhibited by Mr. T. Nock, of Birmingham, possessed many points worthy of commendation; but its efficiency was considerably impaired, owing to the absence of any adequate provision for a supply of hot water. In this class, some stoves by Messrs. Billing and Co. obtained a prize, and are to be commended.

In the class of stoves adapted for very large hotels, public establishments, hospitals, or asylums, a set of apparatus exhibited by Messrs. Leoni and Co. was most deservedly first. The excellence of design and sterling quality of the material and workmanship, should render it one of the most efficient gas-cooking arrangements at present in use. Messrs. Leoni also exhibited several very beautiful stoves for the use of ladies who may desire to become practically acquainted with the art of cooking. The one called the "Lady's Favourite" is so neatly arranged as almost to induce the fair sex to become cooks for the sake of using so pretty a contrivance. Messrs. Leoni and Co., Billing and Co., Messrs. Scott, Brown, and Co., and J. Wright and Co., were specially strong in stoves adapted for use as accessories in the kitchens of large houses, but in some of the exhibits there was not that attention to the arrangement and position of the burner in the roasting chamber, which is necessary for obtaining the best results. The great defect in some of the stoves consisted in allowing too large an air space at the bottom, and not bringing the air more directly into contact with the flame.

In the class devoted to the exhibition of stoves to be used by workmen and artisans, the one exhibited by Mr. J. E. Prust, of Birmingham, and for which the prize in this class was awarded, is quite a marvel of simplicity and cheapness, the cost being only 8s. 6d., including the kettle for hot water. Nearly every exhibitor had stoves in this class, some more expensive than others, but all of them of considerable merit.

The chief feature in the bath class was a contrivance by Mr. W. Puckett, of Marlborough Street, London. It consists of a portable gas-heater, which is directly immersed in the bath, on the same principle as the bath-heater used in many parts of the Continent, where ignited charcoal is used. The quantity of gas consumed to heat the test quantity of water was very small, and where time is not of much consequence this heater appears to be a very economical method of obtaining warm water. Messrs. Strode and Co. exhibited one of their improved circulating heaters, and Messrs. Scott, Brown, and Co. one on a new principle, that very rapidly raised the temperature of the water passing through it.

In Class 9, for heating-stoves, Messrs. Billing and Co., J. Wright and



Co., and Leoni and Co. exhibited some extremely handsome designs, especially the latter firm. The most noteworthy were some stoves in which a fire-resisting composition, with small fragments of platina distributed in it, which after being intensely heated, glows so as to form a very beautiful imitation of an open fire. These stoves throw out a considerable amount of heat. But the most effective and cheerful-looking gas fire was the one exhibited by Mr. E. W. Ball, of Birmingham, where the effect is obtained by three mixed air and gas burners, the flames from which pass through a specially prepared material, which as soon as it becomes heated glows with a bright red appearance, and from which a very large amount of heat radiates. As a gas fire in an ordinary grate it is exceedingly effective.

In Class 10 there were a considerable number of exhibits, the most prominent being the gas-engines of Messrs. Louis Simon and Son, of Nottingham, and the Crossley engine exhibited by Messrs. John Wright and Co. The former is a very ingeniously constructed machine, and is worked by a combination of gas and steam, but does not appear to be so economical as some other engines, and is not so simple in its construction. The prize in this class was awarded to the Crossley engine. As a specimen of steam boiler and engine in which the heating principle was gas, an American engine, exhibited by Mr. W. A. Comber, of Birmingham, was the most efficient, and deservedly received a medal. The other exhibits in this department, except for excellence of workmanship, presented no features of novelty.

The class devoted to the exhibition of stoves designed to use coke was very meagrely filled, and none of the exhibits were of any special importance.

This class closed the Exhibition proper; but in the galleries, spaces were allotted to the following, among many other Exhibitors:—Messrs. W. Parkinson, of Cottage Lane, London, exhibited a case containing a very superior collection of the meters and other gas appliances for which their firm has so long been famed; Messrs. W. and B. Cowan exhibited, among other articles, working models and specimens of Foulis's patent governors; Messrs. Blews and Son, Messrs. Henry Greene and Son, Messrs. George Glover and Co., and Messrs. John Bent and Son, all exhibited some very excellent specimens of meters, test gasholders, testing apparatus, and other specialities.

A very prominent feature in this department was the new and powerful Argand burner exhibited by Mr. William Sugg. It may safely be asserted that electric lights will scarcely be required in any situation where a supply of gas for one of Mr. Sugg's burners can be obtained.

Another great attraction in this department were the models exhibited by Mr. Charles Hunt, of the Windsor Street gas-works, Birmingham. They were unquestionably the most complete and unique series of models of a gas-works ever exhibited, and reflect the highest credit on their designer, and the workmen who constructed them.

A very interesting part of this collection consisted of a variety of burners, arranged in order of merit from the most effective to the most defective. These well deserved the careful study of every one who visited the Exhibition. Near to them were displayed a complete series of chemical products obtained from the residuals—coke, tar, and ammoniacal liquor.

The whole Exhibition reflected the greatest credit on all engaged in its organization. Both the Committee and the Officers of the Gas Department have been indefatigable in their endeavours to carry out the design in the most effective manner, and it is quite certain that the Corporation of Birmingham have come forward in a very spirited manner to promote the use of gas in every practicable form. The jurors, we understand, had a very arduous and onerous duty to perform in awarding the prizes; but we believe their selection has met with general approval. The names of the jurors were Mr. H. Gore and Mr. F. W. Hartley, of London, and Mr. C. Hunt, Mr. H. Hack, and Mr. J. Wood, of the Corporation Gas Department. Large numbers of visitors were present on each day, and a very respectable audience attended the School of Cookery Lectures given at intervals during the day and evening.

The following is the award of the Jurors:—

*Town Hall, Birmingham, June 6, 1878.*

To the Exhibition Sub-Committee of the Gas Department, Corporation of Birmingham.

Gentlemen,—We, the Jurors appointed by you to determine the merits of the various exhibits, and make the awards thereupon, have the honour to report that, after having examined the various apparatus comprised under the eleven competitive classes, and having made comparative tests with many of them during a period extending over Tuesday, Tuesday night, the whole of Wednesday, and a portion of to-day, have made the following awards:—

**Class 1.**—Cooking Apparatus suitable for the house of an artisan.

The Apparatus to be inexpensive, simple in construction, compact and durable, to be capable of cooking, at a moderate cost, the daily meals of a family of from four to eight persons.

Exhibitors to be prepared to show, by practical work, what can be done with a consumption of 10, 20, and 30 cubic feet of gas.

Medal—J. Wright and Co.

Honourable Mention—S. Leoni and Co.

**Class 2.**—Cooking Apparatus adapted to the requirements of a family of from four to eight persons.

The Apparatus to be capable of cooking the daily meals, including dinner of roast meat, two kinds of vegetables, and pudding; and also to provide for a sufficient supply of hot water for cleaning-up purposes, and of boiling water for tea—its selling price not to exceed £3 8s.

Medal—Charles Wilson.

Honourable Mention—E. Millington.

Honourable Mention—J. Williamson.

**Class 3.**—Cooking Apparatus adapted to the requirements of a middle-class family of from six to ten persons.

The Apparatus to provide for roasting, grilling, baking, boiling, stewing, frying, and toasting, and for the supply of hot water.

Medal—Scott, Brown, and Co.

Honourable Mention—J. Wright and Co.

Honourable Mention—Billing and Co.

**Class 4.**—Complete Family Kitchener, adapted to the requirements of a family of from ten to fifteen persons.

This Apparatus to be sufficient for all the cooking, and also for the supply of hot water for kitchen.

Medal—Charles Wilson.

**Class 4A.**—A similar Apparatus, with the addition of a supply of hot water for bath and lavatory.

Medal—Billing and Co.

**Class 5.**—Complete Cooking Apparatus, adapted to the requirements of hotels, clubs, schools, hospitals, &c.

Medal—S. Leoni and Co., Complete Apparatus.

Honourable Mention—Billing and Co., Apparatus and Cooking Utensils.

**Class 6.**—Cooking Apparatus to be used as an accessory in kitchens of large houses, where a coal or coke fire is also intended to be used.

Medal—S. Leoni and Co.

**Class 7.**—Cheap Workman's Stove, for cooking in the workshop.

Medal—J. E. Prust.

**Class 8.**—Baths heated by gas. Quickness in heating, cost, and least consumption of gas to be considered.

Medal—Ewart and Son.

Honourable Mention—W. Puckett.

**Class 9.**—The most cheerful and effective Gas Fire, with the least consumption of gas.

Medal—E. W. Ball.

Honourable Mention—Billing and Co., General Effectiveness and Artistic Merit.

Honourable Mention—S. Leoni and Co., Originality and Effectiveness.

**Class 10.**—Apparatus for Manufacturing or Trade purposes; and Miscellaneous Apparatus.

Medal—J. Wright and Co., *Otto Silent Gas-Engine.*

Medal—W. A. Comber, American *Baxter Steam-Engine, Gas-Heated Boiler.*

Honourable Mention—J. Wright and Co., Excellence in Stoves for Tailors, Hatters, Laundresses, &c.

**Class 11.**—Coke Stoves for Domestic purposes.

Medal—T. D. Clare.

Honourable Mention—J. Wright and Co., Excellence of Design and Construction.

We recommend that a certificate of Honourable Mention be awarded to Messrs. Hassall and Singleton, for substantial construction and general appearance of the stoves exhibited by them.

We have to express our great satisfaction at the meritorious character of the exhibits generally, which, while it enabled us to award all the medals at our disposal, made the task of selection in some cases a matter of extreme difficulty.

(Signed)

HENRY GORE,  
F. W. HARTLEY,  
CHAS. HUNT,  
HENRY HACK,  
JAMES WOOD.

## Communicated Article.

### WATER GAS.

(Continued from p. 832.)

From the time of Val Marino's patent until the introduction of the Kirkham furnace, it may certainly be said that there was no marked departure from the old and faulty track. It was in 1852 that Messrs. John and Thomas Nesham Kirkham took out their first patent (No. 14,238) for "Improvements in the manufacture of gas for lighting and heating;" which improvements consisted mainly "in the mode of obtaining gas by the decomposition of water in close furnaces."

It has been said that the proper place to burn the fuel for generating steam is inside the boiler, and not under or around it, and the method of effecting this object has been with some a subject of serious consideration. We know, as a matter of fact, that it has not yet been accomplished, and we do not believe that its advent is very near, but the process described by Messrs. Kirkham was a movement in that direction. Hence the results achieved far exceeded anything that had previously been attained, the proof of which is the large amount of carbonic oxide and the small amount of carbonic acid produced, a result which until the recent revival of the system in America was considered to be its great fault.

Nodoubt Messrs. Kirkham had in their minds the functions of the foundry cupola and smelting furnace when the mode of working was devised that we are about to describe; but as the cylindrical form was not imperative (the furnace having comparatively no weight to carry within), this portion of the plant is, in the first patent, represented as rectangular, although in practice the patentees adopted the cupola form.

The gasogenes erected by Mr. Rowland at the Municipal Works, New York, are, but for a slight rounding at the ends, of the rectangular form. Messrs. Kirkham, in their patent of 1852, suggest the fixing of a tubular steam boiler over the top of the furnace, in order that the gases of combustion, by passing through it, may generate steam for all purposes of the works. They propose also a tubulated chamber, forming a part of the thoroughfare for these products, into which the air passes to receive heat, that it may enter the furnace as a hot blast. In some of the modern arrangements for making water gas this part of the contrivance is called a heat restorer.

In Messrs. Kirkham's (1852) patent the steam is to be passed up through the incandescent carbon, and nothing is said about a



"mixer;" but the gas is sent on to a holder for storage until required for heating purposes, or to be carburetted, if intended for purposes of illumination.

Prior to drawing attention to the Municipal Works at New York, we must say something more about Messrs. Kirkham's inventions, in order to redeem our promise as regards dates and details. In doing so, we may remark that, although we have before us tracings from drawings, kindly lent by Mr. T. N. Kirkham, of the apparatus erected by the patentees in France so many years since, which show the system to have been, even then, in a compact and practical shape (we say practical, on the assumption that what is being done in America is commercially successful), we deem it more advisable to test the so-called improvements of later date by the original patents themselves.

In the patent of 1854 will be found the improvement, claimed with much earnestness, and a few years since patented in this

country—that is, the passing of the steam downward through the hot coke for decomposing it, instead of upward; also the prototype of the mixer, superheater, regenerator, and, we might almost say, the carburetters and roasters of the present day. The patent drawings show the apparatus spread out in a line so as to make the working with one or more furnaces or gasogenes very understandable. The working drawings have, of course, a compactness and mechanical touch about their details not to be expected in the outline drawings of a patent specification; yet the latter are better for our purpose, bearing, as they do, the evidence of having anticipated all that has since been done, except in some detail arrangements, and adaptations for the use of the mineral oils.

In their specification Messrs. Kirkham state that the apparatus, as shown, is mostly in duplicate, the reason for which is to be explained; but for the purpose of simplifying the description, they prefer to deal with one furnace (the left-hand one) and its connections first.

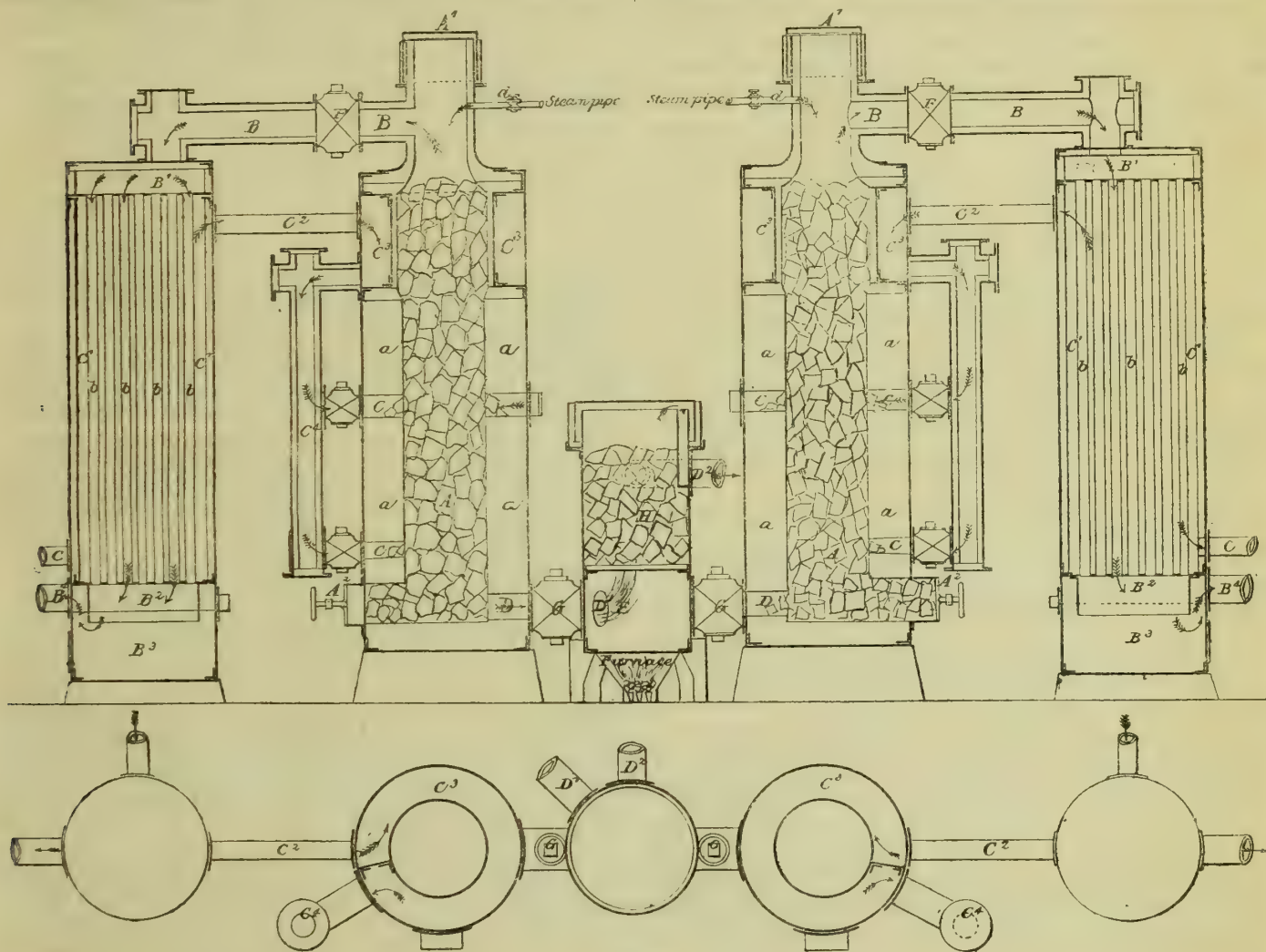


FIG. 2.

"A, fig. 2, is the furnace in which the steam or water is to be decomposed. This furnace is constructed of fire-brick cased with iron, and forming a deep cylindrical space, for the reception of coke. It is closed at top by a water-joint cover, A', which is removed to permit of the furnace being charged with coke. At the bottom of the furnace is an opening, A², to gain access to the interior for the purpose of igniting the coke, and also for clearing out the furnace when required. This opening, when the coke is well lighted, is kept closed (air-tight) by a door until the end of the operation. C C are openings made in the sides of the furnace to admit heated air thereto for keeping up the combustion of the coke.

"The air is supplied to the furnace from a vertical pipe, C⁴, which is connected with an annular chamber, C³, built into or forming part of the furnace. This chamber is fitted with a radial partition, at one side of which a branch pipe, C², enters the chamber, and supplies heated air thereto; while on the opposite side of the partition a branch of the pipe, C⁴, leads off from the chamber, to conduct away the air after it has made the circuit of the mass of incandescent coke in the furnace, and is thereby further heated.

"The temperature of the atmospheric air supplied to the furnace is primarily raised by being conducted by a pipe, C, into a central chamber, C¹, of an air-heating apparatus, fitted with vertical flue-pipes, b b b, which open at top and bottom into the chambers B¹ and B². The upper chamber, B¹, is connected by a pipe, B, with the upper part of the furnace, A, and is intended to conduct the heated gases of combustion therefrom. A cock, F, is fitted to this pipe, for the purpose of cutting off the passage of the gases of combustion at certain periods of the process; but when this cock F is open, the hot gases pass along the pipe B into the chamber B¹, and down the metal flues, b b, into the chamber B². The hot gases will now have parted with most of their heat, and the cold air entering the chamber C¹ by the pipe C, will, by moving upwards in contact with the metal flues, b b, take up a considerable portion of the heat imparted to the flues by the descending gases, and thus enter the annular chamber C³ at a high temperature.

"The gases of combustion having reached the chamber B², will, in order to escape therefrom, have to pass through the water in the tank B³, and they will finally make their exit at the pipe B⁴. Near the bottom of the furnace, A, opposite the firing-hole, is an opening, D, from which a short pipe, provided with a stop-cock, G, leads to a chamber, E, which we term the mixing chamber. The upper part of this chamber is provided

with a grid or grating, for supporting a porous mass of broken bricks or other material, H, suitable for facilitating the mechanical admixture of the gases admitted into this chamber. For the purpose of ensuring in all cases a proper mingling of the gases, provision is made for supplying a furnace heat to the chamber E.

"The steam or water to be decomposed in the furnace, A, is supplied thereto by the pipe d, and the gas rich in carbon is admitted to the mixing chamber by the pipe D¹.

"The operation of this apparatus will be as follows:—The coke in the furnace, A, having been fired through the opening, A², air is admitted through the pipes C to different levels of the furnace to facilitate the complete ignition of the coke; the cock F is then opened, and the cock G is closed; the steam is likewise shut off from the steam-pipe d.

"The products of combustion rise in the furnace, and pass off by the pipe B B to the chamber B¹, thence down the pipes b b b, as shown by the arrows, and finally escape into the atmosphere at the pipe B⁴, as above mentioned. The atmospheric air which enters the pipe C, for the purpose of supplying the furnace, we prefer to force in by a blower, and this blast of air which, as before explained, becomes highly heated before entering the furnace, we keep up until the mass of ignited coke has attained the required heat—viz., to that of fused iron, or thereabouts. When the furnace has reached about that heat, the cock F is then shut, the supply of air is cut off, and the egress of the products of combustion by the pipe B is then stopped. Steam or water is now injected on to the red hot coke through the pipe d, and the cock G is turned on to open a communication between the furnace and the mixing chamber, E. The steam on entering the upper part of the furnace will pass down through the mass of red hot coke, and, on arriving at the point of greatest heat, it will become decomposed into its elements. The hydrogen thus liberated will pass off by the open cock G into the chamber E. This chamber is supplied by the pipe D¹ with a gas rich in carbon, obtained by the ordinary process of gas-making. The two gases will then pass upwards into and through the mass of porous material, H, and being by that means divided into minute streams, they will become thoroughly mixed together. The carburetted hydrogen thus produced is then led off by the pipe D² to the purifiers, where it may be purified in the usual way, and rendered fit for burning. When the coke has parted with a great portion of its heat, and it is no longer able to decompose the steam, the supply of steam is cut off, and the cock G is shut. The cock F is then opened, and atmo-



spheric air is again thrown into the furnace to raise it to its former high temperature. As soon as this is attained, the decomposition of the steam and the transfer of the gas to the mixing chamber is repeated. It will now be seen that the action of the apparatus must necessarily be intermittent; we, therefore, avail ourselves of the use of a pair of furnaces, A (or two or more pairs, according to the amount of gas required to be produced in a given time), and these two furnaces (which are similarly provided with an air-heating apparatus) we connect to the same mixing chamber, and work them so that they shall alternately supply gas thereto to be mixed with a gas rich in carbon, as above explained. Thus, while one furnace is decomposing steam and generating gas, the other will be getting up its heat, and *vice versa*, by which means a continuous supply of gas will be given off from the apparatus."

In the early part of this article we quoted from a report made by M. Pelouze, in 1854, to the Municipal Council of Paris, in reference to Messrs. Kirkham's patent, in which the use of water gas manufactured according to their method was strongly condemned, on account of the presence in it of large quantities of carbonic oxide—a report which doubtless contributed largely to the determination to forbid the manufacture in France. The statements contained in that report were, however, challenged at the time, and it will not be without interest if we now give the translation of a reply made to M. Pelouze by M. Jules Barse, a French chemist. The document is rather lengthy, but it will repay perusal:—

"REPLY to M. Pelouze's Report to the Gas Committee of the Municipal Council of Paris on the Kirkham and Shephard Process.

"M. Pelouze draws his arguments against the Kirkham process from a perusal of the text of Mr. Kirkham's specification, from hearsay, from interested attacks upon his process by industries whose monopolies are threatened by it, and from scientific documents. M. Pelouze has never seen the Kirkham apparatus in operation, and never analyzed the Kirkham gas. He reasons upon the new-comer to the advantage of coal gas, just as, 30 years ago, the partisans of lighting by oil reasoned upon the then newly-arrived coal gas. At that time MM. Pelouze, father and son, defended the cause of industrial progress represented by Wilson, and before him by Lebon; and, thanks to them, progress has ended by being in the right.

"The proscription so formally pronounced upon the Kirkham gas is, therefore, based neither upon experience of the thing proscribed, nor upon disinterested documents to support its absolutism.

"If it is well to publish the opinion of M. Pelouze upon the Kirkham gas, it is equally so to publish also what this opinion is founded upon. It is not founded upon experiment; let us see whether it is upon scientific documents.

"Oxide of carbon, mixed with the atmosphere in the proportion of 1 per cent., kills by poisoning in two minutes. Now, the Kirkham gas contains as much as 30 per cent. of oxide of carbon."

"Let us state more exactly, if possible, than M. Pelouze has done, the deadly proportion of oxide of carbon:—A man breathes per minute 30 litres (one cubic foot) of air, or 60 litres in two minutes. If, therefore, in these 60 litres there are 60 centilitres (36·6 cubic inches) of oxide of carbon, the man will die in two minutes. Let us make the apartment of 10 cubic metres (350 cubic feet) capacity, and an atmosphere thus confined will be deadly as soon as 100 litres (3·5 cubic feet) of oxide of carbon are mixed with it.

"The Kirkham gas, says M. Pelouze, contains as much as 30 per cent. of oxide of carbon, or very nearly one-third of its volume. Admitting, for a moment, the truth of this assertion, 333 litres (about 12 cubic feet) of the Kirkham gas would be required to make in two minutes an atmosphere of 10 cubic metres deadly poisonous.

"Coal gas contains about 13 per cent. of oxide of carbon. This estimate is rather more exact than that of M. Pelouze with respect to the Kirkham gas, and is based upon an experience of 30 years both in France and elsewhere. But it is not spoken about, simply for this reason:—If, in an apartment of 10 cubic metres capacity, 100 litres of oxide of carbon kill in two minutes, 770 litres (27 cubic feet) of coal gas would make this atmosphere deadly. If, in consequence of a tap having been left open, or some leakage existing, either the Kirkham or coal gas inadvertently escapes, each will pass with the same speed through a similar orifice, since they are both of the same density, and subject to the same pressure. If the 333 litres of Kirkham gas take 333 seconds to pass into the apartment, the 770 litres of coal gas will take 770 seconds; and, with the exception of the difference in time, the air of the apartment will be equally poisonous—no more, no less—with coal gas as with Kirkham gas.

"If, therefore, we are to condemn a gas that introduces 1 per cent. of oxide of carbon into an apartment, we must condemn coal gas as well as every other; for, when a tap has been left open, or when there is any other cause of escape, it is not until after the mischief has been done that its cause is ascertained, and this applies equally to coal as to other gases.

"M. Pelouze, as a partisan of lighting by coal gas, will, doubtless, readily allow that, since we ought not to suppress the gas he protects, although it contains 13 per cent. of oxide of carbon, we ought not to condemn any other gas unless it contains more than that quantity of the poison. If he were not of that opinion, I should say that not only does coal gas contain oxide of carbon (*poison*), but also sulphide of carbon (*poison*), cyanhydrate of ammonia (*poison*), sulphuretted hydrogen (*poison*), &c., &c. We could count as many as ten. The Kirkham gas contains nothing of the kind.

"Now, prussic acid and its combinations stupefy an animal that inhales them in infinitesimal doses. Coal gas contains these poisons in less than infinitesimal doses. Whatever care may be taken to purify it from these poisonous elements, the supervision of the public health, so dangerously exposed, should not be left to the care of the workmen in charge of the purifiers.

"Under this head coal gas is attacked by the report presented by M. Pelouze to the Municipal Council. But let us estimate at their real value the phantom invoked against the Kirkham process, and the ten others that have sprung out of coal gas at the call of the former. Coal gas does not kill; the Kirkham gas does not even threaten to kill its late *confère*, and water gas, even were it what M. Pelouze supposes, would still be very different from the gas of which M. Ebelmen has made some thousands of cubic metres. The illustrious President of the Gas Commission, in explaining to the Academy the uses of a gas composed of 90 per cent. of oxide of carbon, did not rise to condemn it. Whatever may be said, the number of deaths from oxide of carbon are very few in comparison with the extent to which this gas is employed in metallurgical operations.

"But what is the Kirkham gas? How much oxide of carbon does it contain? The Kirkham gas is produced by the decomposition of water by carbon. The process is new, but its principle is not. It is Lavoisier who, writing in 1793, teaches us what results from the decomposition of water by incandescent carbon, when describing the memorable experiment which gave birth to all modern chemistry:—

"In a tube there are placed some moderate sized pieces of carbon, and the tube is then placed upon a furnace. To one extremity of this tube there is attached a glass retort containing a quantity of distilled water. At the other extremity a serpentine pipe is added, for condensing the liquid

products to be formed. At the end of this serpentine pipe a tube is arranged to convey the æriform fluids or gases into an apparatus suitable for determining their quantity and quality.

"A fire is lighted in the furnace, and so maintained as to cause the tube to become red hot; in the meantime the water in the retort is made to boil. A portion of this water, which passes through the tube, condenses in the serpentine pipe; but meanwhile a considerable quantity of gas is liberated, and this escapes into the measuring vessel. The operation finished, nothing is found in the tube but a few ashes; the carbon has totally disappeared.

"When the gases which have been liberated are examined with care, they are found to weigh altogether 113·7 grains; their total volume is 524 cubic inches. They are of two kinds—namely, 144 cubic inches of carbonic acid, weighing 100 grains, and 380 cubic inches of an extremely light gas, weighing 13·7 grains. If we verify the weight of the water that has not been decomposed, we find that it has diminished by 85·7 grains.

"But I have shown that in order to form 100 grains of carbonic acid, it was necessary to unite 72 grains of oxygen with 28 grains of carbon; therefore the 28 grains of carbon placed in the tube have taken from the water 72 grains of oxygen. Therefore, 85·7 grains of water are composed of 72 grains of oxygen and 13·7 grains of hydrogen. To recapitulate, 100 parts of water are composed of 85 of oxygen and 15 of hydrogen."

"Lavoisier calls the 144 cubic inches of the gas weighing 100 grains, carbonic acid, and he informs us that these 100 grains contain 72 grains of oxygen and 28 grains of carbon.

"After 60 years improvements in the apparatus, Berzelius and all the other chemists make a correction in the density and composition of carbonic acid. We now say that 100 grains of carbonic acid contain—

	According to Lavoisier.	According to Berzelius.
Oxygen . . . . .	72 grains.	72·85 grains.
Carbon . . . . .	28    "	27·65    "
Total weight . . . . .	100 grains.	100·00 grains.

Sixty years progress in perfecting the instruments have, therefore, led to the correction of half a grain in the composition of carbonic acid as found by Lavoisier, who used to produce 100 grains of carbonic acid with 87·7 grains of water.

"The principle of the Kirkham process was, therefore, found out in 1793, at which period all the water was decomposed into carbonic acid and hydrogen. That is an unquestionable fact. What does it matter if, since then, water may have been decomposed into oxide of carbon and into hydrogen? Is Lavoisier's process lost? No. Therefore we can do to-day what he did in 1793.

"This was why M. Dumas was right in directing his friend Selligie's attention to the manufacture of water gas. This is why M. Jacquelin, at the Société d'Encouragement, presided over by M. Dumas, was able to announce as one of the greatest progresses of our time the taking up again of the processes for the manufacture of gas from water, and to propose the establishment of a national prize for the authors, whom, now, M. Pelouze simply denounces to the police.

"We need not participate in M. Jacquelin's enthusiasm; but, at least, before adopting the conclusions of M. Pelouze, let us look at the Kirkham process; let us not stifle it before its birth. Preventive persecutions in scientific and industrial matters recall too gloomy recollections. The history of Lebon and Wilson, those unfortunate precursors of the success of coal gas, so eloquently introduced by M. Pelouze in his treatise on gas, imposes upon us the duty of seeing before judging, of judging before condemning.

"It is proved that water passing over incandescent coke may be decomposed into carbonic acid and hydrogen; *à fortiori*, as M. Pelouze says, it may be decomposed into gas containing 1, 2, 3, 5, or 10 per cent. of oxide of carbon. In this proportion water gas will be still less deleterious than coal gas, and as it is impossible to manufacture gas from coal without oxide of carbon, as all coal gas manufactured up to now contains from 12 to 13 per cent. of this poison, we must conclude that there can be no further improvement in coal gas, while absolute perfection may be attained by the decomposition of water.

"Let us now pass to the objections raised against the borrowed carburation. First of all, let us ask M. Pelouze what coal gas would be after the condensation of the hydrocarbonaceous vapours which it mechanically carries with it. It is notorious, I suppose, that without the 7 to 15 per cent. of these vapours mixed with this gas, it would be, as after the action of chlorine, a very poor lighting element. In this case—in winter, for example—the volume remaining after condensation would be from 85 to 90; and out of this volume there would be 12 to 13 parts of oxide of carbon, which never condenses.

"If coal gas did not contain the vapours that M. Pelouze disapproves of in water gas, I should understand the reason for his objection; but in this case the objection applies equally to coal gas.

"Be that as it may, will the Kirkham gas be a mixture of vapours and pure hydrogen, as M. Pelouze supposes? No. A quadricarbonaceous gas, similar to that obtained from coal, resin, or oil of schist, will receive the pure hydrogen in its passage from the cylinder to the gasholder. All permanent gases, whatever may be their respective densities, mix with and penetrate into each other molecule by molecule; that, at any rate, is what M. Pelouze teaches in his excellent treatises on chemistry. We even find, in his last editions—when referring to the water gas employed in M. Christolfe's workshops, for example—opinions which accord but little with those expressed in the Municipal Council. As far as we know, no one died in M. Christolfe's establishment, and everybody saw clearly; but at what cost? M. Lacarrière or some one else might be able to tell us, as the gas manufactured at that time was not produced by the Kirkham apparatus.

"To sum up, then, will the water gas prepared by the Alliance Company be innocuous? Will it be luminous? M. Pelouze does not know; he has neither seen nor analyzed it. The Alliance Company know something about it. Madrid is lighted to the extent of some 32,000 metres (about 20 miles) by the Kirkham gas. The Alliance Company also know, and on reading the text of Kirkham's patents—patents taken from an English point of view, where the use of oxide of carbon is not forbidden—we find that the Kirkham gas may give up to 30 per cent. of oxide of carbon.

"But the Alliance Company assert that, in France, the Kirkham apparatus, managed according to the rules laid down by Lavoisier, will never give so much oxide of carbon as may be contained in even the best purified coal gas. The Company go even farther, and assert that by adhering more and more closely to Lavoisier's principle, by practice, and by following the advice they find given in the works of M. Pelouze, they will arrive at producing a gas totally free from oxide of carbon.

"If Coal Gas Companies show themselves eager to come to conclusions before making any experiments whatsoever, we must presume that they consider themselves in the presence of very formidable adversaries. Are the anxieties of the Gas Companies to be shared, or, rather, embraced by the Municipal Administration? Such is, after all, the real question.

"Paris, July 5, 1854."

"JULES BARSE, Chemist.

(To be continued.)



## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

## THE TEMPERATURE OF GAS IN ASCENSION-PIPES.

SIR,—I am amused at the cool way in which Mr. Collinge ignores my letter in the JOURNAL of the 28th ult., detailing the experiments I made on this subject, and the conclusions, mainly in anticipation of his own, at which I arrived.

There can be little doubt, as my experiments prove, that the high temperatures which Mr. R. O. Paterson found in the ascension-pipe were not those of the gas at all, but were chiefly due to the volatile tarry matter in suspension therein.

The remark contained in your foot-note to Mr. Collinge's letter is just, and it is desirable that the faculty of "accurate observation" should be extended to reading as well as experimenting.

5, Norfolk Street, Manchester, June 5, 1878. THOS. NEWEIGGING.

## COMMISSIONS.

SIR,—In *The Times* of the 6th inst., there was a leading article on the above subject, which may have escaped the notice of many of your readers.

Will you allow me to give a few extracts from it?

"The practice of receiving commissions has been pronounced illegal in every way, and this in terms which will make it impossible for any man to meddle with it with a notion that he can be acting honestly. A usage, however prevalent, which is declared to be corrupt in itself and opposed to common morality, must be held to go far beyond the doubtful border line at which impropriety begins. . . . It is obvious, too, that to one side or the other a commission must be unjust. If the receiver of it does the work he is paid for, it is his principal who will suffer. If he takes it and does nothing for it, it is hard to see what sort of defence he can make for putting it, thus unearned, into his pocket. . . . His judgment, if he cares to think about the matter at all, will be influenced in the way intended, and he will give advice which is not the best, or will accept terms which are less favourable than they might have been. . . . From this time forward the law, at all events, will be certain. Until the case of *Harrington v. The Victoria Graving Dock Company* has been reversed on appeal—and we scarcely think it likely it will be carried into the Appeal Court—the rule will hold good, that a commission is in its very essence an illegal and a fraudulent thing. There is, indeed, no point of view left from which the law has not been declared against it. . . . The weak point in the matter is that it is so very seldom that the offence can be brought to light. Only two parties need know of it, and it is to the interest of both of them to keep it secret. But it is of no slight importance, even so, that the law of the case should be clearly settled. Many a man will do an act which he knows to be not quite honourable, and will yet shrink from what the common voice of mankind has pronounced to be downright dishonesty. There is no room left now for subterfuge in the matter of commissions. They are dishonourable and they are dishonest too, and those who give them and those who take them must expect to be judged accordingly."

I hope the forthcoming meeting of the British Association of Gas Managers will not be allowed to pass without such an expression of disapproval of the system as will tend to its abolition amongst Gas Officials.

INQUIRER.

## THE CHANNEL PASSAGE TO THE PARIS EXHIBITION.

SIR,—As a large number of my gas brethren, Members of the British Association of Gas Managers, will, on the 21st inst., be crossing the Channel on their official visit to the Paris Gas-Works and the "Gas Lighting Section" at the Paris Exhibition, will you, through "our JOURNAL," allow me to give them a hint to avoid sea-sickness, culled from a late number of the *Daisy*? A gentleman, who has often to cross the Channel, writes "that he made his respiration coincide punctually with the heave and fall of the vessel. As she rose he inspired slowly and regularly, and as she fell he expired correspondingly, the effect being so completely successful as, at several times, to produce sleep; but each of these times, presumably because the breathing was not then synchronous with the vessel's movements, he was awakened by sensations of sickness, which two inspirations and expirations, as above explained, immediately dispelled, enabling him to complete a very rough passage with comparative comfort."

There can be no doubt that sea-sickness arises, in a great measure, from the oscillation of the diaphragm of the stomach, and I can perfectly understand that, if the breathing is made to correspond with the pitch of the vessel, there will be less cause for sickness. The remedy proposed is, therefore, well worth a trial; and, as I shall myself put it to the test on the occasion named above, I trust I shall prove it to be successful, as I am not a good sailor.

Sydenham, S.E., June 8, 1878.

MAGNUS OHREN.

## THE REMOVAL OF SULPHUR COMPOUNDS.

SIR,—Some few weeks since I stated the fact of my being in the habit of distilling ammonia into the hydraulic main of our works. Will you kindly allow me now to state that I do not find it necessary to coat the ascension-pipes with non-conducting material, to raise the temperature of the gas in the hydraulic main; but I combine steam with the distilled ammonia, and send it into the hydraulic mains at the extreme ends; and, as this heated ammonia and steam have to pass each dip-pipe, from which the crude gas is escaping, they mix freely together, and flow on to the outlet, and enter the horizontal condensing main with the tar and liquor. In this way I can readily raise the temperature of the gases in their crude state. I have, of course, provided suitable apparatus to regulate the temperature of the steam, &c., entering the hydraulic main.

As it would not be desirable to convert the tar into pitch at that point, at a spot in the horizontal condensing main where the temperature is about 120° Fahr., I drop the tar and liquor through a dip-pipe into a strong wrought-iron air-tight tank, having a vent into an air-tight tar-well. In this tank the tar settles away from the liquor, and can be readily drawn off into barrels, &c., for the market. The clear liquor is very strong in ammonia; and, as it contains very little carbonic acid, I have provided special means to regulate its temperature, and to pump it direct into what I term a scrubber-washer—an apparatus specially designed to break up the cold gas into the thinnest possible streams, and

bring it into close contact with the strong ammonia which I cause to pass through it.

I do not wash my gas with liquid ammonia on the outlet of the hydraulic main, as was shown the other day in the description you gave of an apparatus in the JOURNAL, because I found, when I made experiments some time since, that a large quantity of thin oily tar was deposited, and the general effect on the gas was not so good as we desired, besides making an extra pull of 3 inches for the exhaustor, and an unsteady gauge on the hydraulic.

I then constructed a kind of brush arrangement, composed of a great number of small wires suspended with their points in water. As the water-line could be regulated in this vessel at pleasure, I could easily increase or decrease the speed of the gases and vapours through the wires or spaces. This worked very well for two seasons, and gave excellent results in breaking up the gas and assisting to deposit condensable matters from the gas. Since then I have made what I consider a better and more powerful arrangement, and it is giving us good results without any additional strain to the exhaustor.

I will not trespass further on your valuable space; but, at some future convenient time, with your kind permission, shall be prepared to give some few practical hints, not only upon the purification of gas by ammonia, but also upon the successful recovery of sulphur and ammonia, and the conversion of the same into sulphate of ammonia.

Lewes, June 1, 1878.

JOHN HAMMOND.

## Parliamentary Intelligence.

## HOUSE OF LORDS.

MONDAY, JUNE 3.

The Examiners reported that no further Standing Orders are applicable to the Cheltenham Corporation Water Bill.

Clitheroe Gas, Water, and Improvement Bill.—Commons amendments considered, and agreed to.

Bangor Local Board Bill,—read the third time, and passed.

Gas and Water Orders Confirmation Bill,—read a second time, and committed.

Petitions were presented against the Public Health Act (1875) Amendment Bill, from the Liverpool Land and House Owners Association; and against alteration in the Cheltenham Corporation Water Bill, from the Cheltenham Water-Works Company.

TUESDAY, JUNE 4.

The Examiners reported that no further Standing Orders are applicable to the Bournemouth Gas and Water Bill, and the Grand Junction Water Bill.

Newbury Borough Extension Bill,—reported.

Drumcondra, Clonliffe, and Glasnevin Township Bill,—brought from the Commons, read the first time, and referred to the Examiners.

Local Government Provisional Orders (Droitwich, &c.) Bill,—read a second time, and committed.

Gas and Water Orders Confirmation Bill,—considered in Committee of the whole House, and reported without amendment.

A petition against the Cheltenham Corporation Water Bill was presented from the Ecclesiastical Commissioners of England.

## PUBLIC HEALTH ACT (1875) AMENDMENT BILL.

On the motion for going into Committee on this Bill,

Earl DE LA WARR said he thought that the measure might lead to unreasonable expense in some instances. Careful inquiry into the details of its provisions was desirable, and he therefore moved that it be referred to a Select Committee.

Earl COWPER said he thought that before their lordships entrusted the Rural Sanitary Authorities with increased powers, they ought to inquire into the way the work already entrusted to them was discharged by those bodies. He thought it was done in a very unsatisfactory manner. In many cases the members quarrelled among themselves and did nothing else; in other instances they were completely in the hands of their medical man; and in others everything was carried against the single representative of a parish, by the persons who represented the other parishes.

Lord NORTON objected to arresting the progress of the Bill, which was brought forward a second time by private Members of the other House fully competent to deal with the subject, while the Government had not found time or opportunity to deal with the subject more perfectly; but he regretted the recommencement of patchwork sanitary legislation so soon after its consolidation. The Sanitary Commission, of which he was Chairman from 1869 to 1871, to which many eminent men had devoted much attention, and whose report had been the basis of all subsequent sanitary legislation, considered the chief cause of the imperfect working of the law was the complication of the law itself and the multiplication of Acts in detail. He had, immediately upon the report, attempted a consolidating Bill, and meanwhile had a digest made of all the numerous Acts. The late Government the next year passed an Act preparing the way for consolidation, and the present Government passed the Public Health Act of 1875, of which this Bill dealt partially with one part only—namely, water supply. The Act of 1875 did not pretend to be complete in many parts, and especially in this of water supply. The Sanitary Commission said that water supply was the most difficult part of their inquiry, because it dealt not only with the interests of local authorities and consumers, but with intricate proprietary rights, and places could not well be compulsorily supplied without consideration of the whole watershed, which introduced further questions of area and rating. This Bill dealt only with rural districts and with them imperfectly, as the report of the Select Committee, to whom the Bill was referred, amply showed. Its clauses ran parallel with sections unrepealed of the Act of 1875, and the charging water rates and rents might be under either or both. Still, the Bill should pass as a step in the right direction, and as compelling the Government to complete the subject next session, and to make one complete Act on water supply, repealing the sections on the subject in the Act of 1875. To rescue water from pollution was inseparable also from its supply.

Earl KIMBERLEY said he hoped their lordships would not consent to refer the Bill to a Select Committee. Though the change proposed by it was important, it was but a small advance on the existing law. The consolidating Act of 1875 enabled the Rural Authorities to construct works for the purpose of supplying water, and to tax the whole parish for those works. It was quite clear that in some cases that might be an oppressive mode of proceeding. The Bill before their lordships would give the Rural Authorities power to charge the owners of particular cottages with a water supply for those cottages. No such charge as that supposed by the noble Earl who moved the amendment could be thrown on an owner. Clause 2 enacted that the supply must be provided at a reasonable cost, not exceeding a capital sum, the interest on which, at the rate of 5 per cent., would amount to 2d. per week. It was true that in the clause as it stood there



were added the words, "or at such other cost as the Local Government Board may, on the application of the Local Authority, determine, under all the circumstances of the case, to be reasonable;" but he intended to propose an amendment which would limit the power of increase by the Local Government Board to a sum which would make the entire cost not exceed an interest of 3d. per week. There were some persons who had crotchets against improvements, but as there was nothing more important than a pure supply of water, he hoped their lordships would not delay this measure by sending it to a Select Committee.

The Marquis of SALISBURY presumed that his noble friend meant to convey that those who opposed this Bill were the people who had crotchets against improvements. He did not oppose the Bill, but he ventured to repeat what he said on the second reading, that caution was necessary in order that the rent of cottages might not be raised, as this would be a very serious calamity to the labouring classes. Owing to strikes and the rise of prices, the cost of cottage building had considerably increased. It might be argued that it was desirable to have cottages with the best possible water supply. They might argue in that way and be victorious in the argument; but if they added to the cost and difficulty of building cottages, and if, as a consequence, those who now built them abstained from doing so, they would have won a damaging and dangerous victory in a sanitary point of view, for the overcrowding of cottages would be the result. They ought to take care that this Bill did not increase the difficulty already experienced by the labouring classes in obtaining cottages, because that would be a very serious calamity.

The amendment was then negatived without a division, and the House went into Committee on the Bill.

Clause 1 was agreed to.

On clause 2,

Earl FORTESCUE moved an amendment, making it compulsory upon every Rural Sanitary Authority to see that every occupied house in their district had, "within reasonably accessible distance, a supply of wholesome water for their drinking and cooking," thus drawing a distinction in the Bill between water for cooking and drinking, and water used for other domestic purposes. He said there was a much greater consumption of water for the latter than for the former purposes, and, therefore, on grounds of economy it was desirable to make a distinction between pot water and slop water.

The Duke of RICHMOND and GORDON hoped that the noble Earl (Lord Kimberley) who had charge of the Bill would not accede to the amendment. The Medical Officer of the Board of Health reported that in 1873 there were 240 cases of fever caused by washing, in unwholesome water, vessels in which food was afterwards cooked.

Earl KIMBERLEY could not accept the amendment.

The Marquis of BATH said that it would be a harsh thing to make the owner of a worthless cottage incur the expense of a water supply, even though he might wish to throw the cottage down.

The amendment was negatived without a division.

Earl KIMBERLEY proposed an amendment to limit the power of the Local Government Board, in respect of charge for water supply, to raising the outlay to more than a sum which would be covered by 3d. per week for interest at 5 per cent.

The amendment was agreed to, and the clause, as amended, was agreed to, as was also clause 3.

On clause 4, giving an owner a right of appeal against a requirement to provide a water supply,

The Marquis of BATH said the right of appeal was given by the clause under these five different conditions:—(1) If the supply of water was not required under the circumstances of the case; (2) if the time limited by the notice for providing the supply was insufficient; (3) if it was impracticable to provide the supply at a reasonable cost; (4) if the local authority itself ought to provide a supply of water for the district; and (5) if the whole or part of the expense of providing the supply ought to be a charge on the district. The appeal with regard to the first three conditions lay to the Justices in Petty Sessions; and with regard to the last two conditions, it lay to the Local Government Board. He contended that the appeal ought to be in all cases to the Local Government Board. The working of the Bill would virtually lie with the Inspectors acting under the Local Authority, persons who in many instances were not fit to be entrusted with such functions, being without either education or experience. If an appeal were made under either of the three first conditions above named, the Justices in Petty Sessions would hear the evidence of the Inspector and that adduced on behalf of the owner, which might be very conflicting; but they would have no technical knowledge or any means of arriving at a sound or impartial judgment on the merits of the case. Speaking as a landlord, he would himself much prefer that the question should be decided by the practical knowledge of an Engineer or Surveyor sent down by the Local Government Board. In a small village not far from his own neighbourhood, the Local Authority, by the advice of their Inspector, established a system of drainage which, instead of improving the sanitary condition of the village, made it a great deal worse than it was before. An application was made, by persons interested in the matter, to the Local Government Board, who sent down their Engineer, and that officer reported that the whole of the works which had been executed by the Sanitary Authority, and for which the proprietors of houses had been charged, were utterly valueless. To guard against the recurrence of such cases he would, therefore, suggest that the clause be so altered as to let the appeal lie to the Local Government Board, and not to the Justices in Petty Sessions.

Earl KIMBERLEY said a reference to the Public Health Act would show that the argument went in the contrary direction to that which the Marquis of Bath had indicated. It so happened that in that Act—under which this appeal was to be instituted—it was provided that the works should not be commenced without the sanction of the Local Government Board, and that the Board might appoint an Inspector to make an inquiry on the spot. He confessed he had rather a liking for Local Authorities, and had not that distrust of Justices in Petty Sessions which the noble Marquis seemed to entertain. He hoped their lordships would not alter the clause.

The clause was then agreed to, as was also clause 5, as amended.

The other clauses were agreed to, and the Bill was ordered to be reported to the House.

THURSDAY, JUNE 6.

Bradford Water and Improvement Bill.—A report was read from the Select Committee, that the Committee had not proceeded with the consideration of the Bill, having found that the petitioners had no *locus standi* before them. The Bill was therefore committed as unopposed, and reported specially with amendments.

Stoke-upon-Trent Corporation Gas Bill,—reported with an amendment.

Cheltenham Corporation Water Bill, East Retford Borough Bill, Radcliffe and Pilkington Gas Bill,—read a second time, and committed.

Local Government Provisional Orders (Droitwich, &c.) Bill,—considered in Committee of the whole House, and reported without amendment.

Gas and Water Orders Confirmation Bill,—read the third time, and passed.

The Accounts of the Metropolitan Gas Companies for the Year 1877 were presented.

Petitions against the Durham Water Bill (pursuant to leave given on Friday, May 31) were presented from (1) Corporation of Durham, (2) Rev. William Greenwell and George Gradon.

FRIDAY, JUNE 7.

The Examiners reported that no further Standing Orders are applicable to the Drumcondra, Clonliffe, and Glasnevin Township Bill.

Bournemouth Gas and Water Bill, Grand Junction Water Bill,—read a second time, and committed.

Local Government Provisional Orders (Droitwich, &c.) Bill,—read the third time, and passed.

## HOUSE OF COMMONS.

MONDAY, JUNE 3.

Drumcondra, Clonliffe, and Glasnevin Township Bill,—read the third time, and passed.

Exeter Corporation Water Bill (Lords), South Staffordshire Water Bill (Lords),—read a second time, and committed.

The *locus standi* of the Corporation of Warrington, as petitioners against the Warrington Water Bill, has been disallowed, except as against clauses 6, 12, 20, 21, and 23, and so much of the preamble as relates thereto.

TUESDAY, JUNE 4.

Nottingham Improvement (Gas, &c.) Bill, Southport Water Bill.—Lords amendments agreed to.

## NEWRY GAS BILL (LORDS).

Mr. RAIKES reported from the Committee on this Bill, that a certificate, under the seal of the Local Government Board of Ireland, had been produced before the Committee (under Standing Order No. 179) setting forth that the application for the powers sought to be obtained by the Bill was made without the sanction or approval of that Board. It appeared, however, to the Committee, that the object of the Bill, being to transfer to the Town Commissioners of Newry the undertaking of the Newry Gas Consumers Company, could not be obtained by a Provisional Order, but by an Act of Parliament. The Committee, therefore, considered it for the public advantage that the Bill should pass. They had examined the allegations of the Bill, and found the same to be true, and had gone through the Bill, and made amendments thereunto.

FRIDAY, JUNE 7.

Leicester Corporation Bill (Lords),—reported with amendments.

## HOUSE OF COMMONS COMMITTEE.

FRIDAY, MARCH 22.

(Before Mr. J. HOLMES, Chairman; Mr. W. G. CARTWRIGHT, Mr. BARNE, and Mr. BOWEN; Mr. BONHAM-CARTER, Referee.)

## NOTTINGHAM WATER BILL.

## NOTTINGHAM IMPROVEMENT, GAS, AND WATER BILL.

(Concluded from p. 877.)

Alderman Thackeray recalled, and further cross-examined by Mr. MICHAEL.

I have paid a great deal of attention to this matter, and in 1874 I gave evidence on the Bill of the Company before the Select Committee. I concur in the statement made yesterday as to the terms for the purchase of the Company's undertaking. I have made no calculation to ascertain how much a consumer, who now pays 45 to the Company for his water supply, would have to pay the Corporation if they purchased the works. I believe the result of the transfer of the undertaking to the Corporation would be the provision of a cheaper supply of water, partly because of the lower rate at which the Corporation could raise capital. There would be an increased profit on the working of nearly 1 per cent. I believe the surplus profit will be upwards of £21,000.

Mr. MICHAEL: I assume, then, the Company make more profit than will pay their dividend, and this would have the effect of lowering the price. Do not you know that the general law of the land provides that as soon as a Water Company have paid maximum dividends, if there is a further sum, it must be devoted to reducing the price of water?

Witness: Yes, that is so.

Then will you tell the Committee how the consumer is to be advantaged?—Of course, if the Company at the present moment have this surplus, which I am told is the case, they would have to reduce the charge for water; but it is not at the present moment only I am looking. I admit that at the present, and at the large price we propose to pay the Shareholders, we should absorb all, and perhaps more than the present surplus applicable to dividend; but we should get rid of these parliamentary contests. We should save the costs of these, and in further capital that might be raised, as I have said, we should save.

Re-examined by Mr. VENABLES: The effect of the Company raising new capital at the present rate would be to enable them to divide those receipts which they cannot now divide. I believe that there will be a saving in raising the money if the Corporation get the works, and that, on the whole, the bargain will be advantageous to the Corporation and to Nottingham, and at the same time to the Shareholders?

The CHAIRMAN: The Corporation already have the gas under their management, have they not?

Witness: Yes.

Mr. S. G. Johnson, examined by Mr. VENABLES.

I am the Town Clerk of Nottingham. I am aware of the circumstances connected with the purchase of the gas-works. Those works were transferred to the Corporation from the Gas Company by voluntary agreement. The maximum dividend which the Gas Company could pay was 5½ per cent. We paid them 4 per cent. additional dividend for seven years, making it 6½, and at the end of seven years we paid them 1 per cent. Those were less favourable terms than we now offer to the Water Company. The Gas Company at that time were paying their maximum dividend. The result of the purchase of the gas-works has been very advantageous to the town, enabling us to reduce the price of gas twice and to increase the reserve-fund. We pay perpetual annuities to the old shareholders, and we have a sinking-fund, so that we shall ultimately redeem those annuities, and in course of time the gas-works will belong to the town, free of any capital charge. The purchase was satisfactory to the town; it was voluntary, and the shareholders were satisfied with the bargain they made. With reference to the affairs of the Water Company, I think of late years the excess of their receipts beyond the amount available for dividend has been about £3000 per annum. The maximum dividend amounts to £17,500, and the amount of profit available for dividend last year was £19,797, being an excess of about £2500. We have not the subsequent account, but we have every reason to believe that this year there will be a very large increase in the sum available for distribution as dividend. We estimate that there will be £22,000, being £4000



or £5000 more than can be divided. As long as they acquire no additional capital, that surplus gives them no profit. The only thing for them to do would be to reduce the rates for water. If they raised £100,000 new capital, the advantage to them in having profits in hand would be in being enabled to pay their Shareholders 5 per cent. on the capital, and they would get £75,000 bonus. The reasons of the Corporation for desiring to obtain the water-works are these: First of all, the Town Council would do the financing instead of the Company—i.e., instead of raising money at 5 per cent., and large bonuses being put into the pockets of the Shareholders, the Corporation could effect a saving by borrowing money at a little under 4 per cent. Then we should supply the outlying villages, such as Carlton, with water much quicker than the Company, for this reason: The trade of Nottingham is carried on as much in the outlying villages as in the town itself. The lace goes in and out, and in the stockings or hosiery trade the articles are carried in and out, being manufactured in the town, and taken out to such villages as Carlton to be finished. If there is any epidemic at Carlton, it is certainly seriously felt in Nottingham. For instance, there was a short time ago a small-pox epidemic at Sneinton, and that cost us £10,000, for we were obliged at last to take all the patients suffering from the small-pox, and put them in our own hospitals, in order to stamp out the disease. We have already parliamentary authority to supply these outlying districts with water, whereas the Company have no power to extend their limits. We have supplied all these places with gas, and we could do the same with water. In the next place, we should, as we are now doing in the matter of the gas, put aside the sinking-fund which Parliament would fix, with which the capital debt of the undertaking would be ultimately wiped out. Then we should also be saved, as has been mentioned by Alderman Thackeray, the cost of continual parliamentary litigation. Then we should have, instead of duality in municipal management in certain things, uniformity of management. We should have, for instance, the control of the streets, the repair of the streets, and the watering of the streets. As it is at present, the Company have a right to disturb the streets, and we have to see that they do their duty in putting the streets to rights again. We are not here to make complaints, but in practice it has been this, that we do the repairs ourselves, because it is more convenient. We water the streets, and the Company supply us with water. They supply us through meters, but if we had the control of the water, we should most probably avail ourselves of the natural pressure of the water, and distribute it for the watering of the streets. As it now comes to us through meters the pressure is lost. Then there is a duality of management in respect to fires. The Council have the fire-engines and the men, but the Company have the turncocks and the hydrants. It, therefore, requires the action of two independent bodies before a proper supply of water can be had for a fire. With regard to requiring a proper water supply to tenants, we have the power of compelling a supply, but the Company have not. The Company can only supply after we have taken action in the matter. In those respects there would certainly be great convenience, and in course of time economy, arising out of the transfer of the undertaking. The main and strongest motive of the Corporation in wishing to acquire the water-works is that of economy to the community. I have ascertained the feelings of the ratepayers on the subject. They are undoubtedly anxious for a change, and every November election brings in men who are pledged to do what they can to get the control of the water supply into the hands of the Corporation. Last November all the members of the Council retired, in consequence of an extension of the limits of the borough, and the ratepayers then made it the leading question that their representatives should strive to get the supply of water into the hands of the Corporation. The 6 per cent. that the Council offered in 1873 and 1874 was freely discussed. The ratepayers thought that it was a very liberal offer, but they seemed quite willing to pay that large sum rather than have the water supply in the hands of a private enterprise. By the authority of the Corporation, I a short time ago addressed a letter to the Directors of the Water-Works Company, offering to pay them, for the purchase of the water-works, all their lands and appurtenances, 30 years purchase of the maximum parliamentary dividend of the Company, to pay up the arrears of old dividends, and to pay off their mortgages, debts, and obligations, and showing that the Council would undertake to supply the districts as was now proposed by the Company to supply, and to supply Hucknall in bulk, as required by the Local Board. On Feb. 19, 1878, I was directed by the Nottingham Corporation to offer to pay to each Shareholder of the Company in respect of a £50 share a perpetual annuity of £3 per annum, and to each Shareholder in respect to a smaller amount a perpetual annuity in proportion; secondly, to pay off the arrears on the old dividends, if there be any. That offer was made with the view of the Corporation obtaining the control of the water supply, which for public reasons should be in their hands, and also with the view of avoiding the cost of perpetual litigation, which the Town Council are anxious should not recur. This offer was considered by the Corporation to be a very liberal one, and more than the value of the undertaking, not only in its present position but the value of its future development. The same offer was made in 1874. I think it would be an advantageous investment for the Nottingham Corporation. It would at any rate meet with the approval of the public to have the supply of water in their own hands.

Cross-examined by Mr. MICHAEL: The manufacturing supply should always be made subsidiary to the domestic supply. I believe as a rule it is so in this case. We do not come here with a grievance, but we consider it a misfortune that there is a duality of management. If the works were in the hands of the Corporation, they would be worked by the same staff. I do not know that if additional duties were imposed upon that staff they would require additional remuneration. As a matter of fact, I am paid an additional salary on account of the gas-works having come under the management of the Corporation, and, as a general rule, it is quite right that it should be so. When I said that the Corporation had power to go beyond the boundary of the borough in order to supply water in the surrounding districts, I referred, not to their special Act, but to the Public Health Act of 1875, which states that we may, with the sanction of the Local Government Board, go into any adjoining district on such terms as may be agreed on between such authorities, or, in case of dispute, as may be settled by arbitration. I am not clear, with respect to the supply of water in our own district, that we have any difficulty in bringing compulsory power to bear upon the Company. We have had to close a number of wells in the borough. I was very much surprised when I heard in this room that the Scotchholme water is still used by the Company. In 1869 Mr. Hawksley declared that the water from the Scotchholme Springs was wholly unfit for consumption.

The CHAIRMAN: Was there any complaint about the gas-works when they were taken over?

Witness: None at all.

This concluded the case for the Corporation.

Mr. PEMERKE STEPHENS addressed the Committee on behalf of the Hucknall Local Board, in opposition to the Bill of the Company. He said the Company had been twice officially requested to supply water to the district, and had on each occasion refused. In 1874 they were asked to sell water to Hucknall, and they refused to do so; and that although, as had been shown, their position as regarded the supply was as good as it

was now. In 1877 an application for supply was again made and refused. The Board had now made an application for a Provisional Order enabling them to supply themselves, and they did not desire to be handed over to this or any other Company. In support of their Bill the promoters had put Dr. Pole forward as a witness. Dr. Pole was called to curse, and he came to bless, for the report he referred to, of the Royal Commission on Water Supply, recommended that the distribution should be in the hands of the Local Authorities rather than in the hands of Companies. The Hucknall Local Board being now free from any Company, wished to keep so; and they asked the Committee to take the evidence produced on the part of the promoters as the strongest reason why Hucknall should not be handed over to them.

At the close of the learned counsel's address, the room was cleared, in order that the Committee might consult with respect to the evidence to be offered by the Hucknall Local Board. Upon the re-admission of the parties,

The CHAIRMAN said: The Committee have decided to pass the petition of the Hucknall Local Board, but giving the Company the right of way for their pipes through the district.

Mr. MICHAEL, in replying upon the whole case on behalf of the Company, said: It appears that the Corporation do not object to the scheme in its entirety, or to any part of it—that is to say, they not only think it desirable, but necessary, in order to promote the sanitary welfare of the borough of Nottingham, that the power we seek should be vested in one authority or the other. Thus they do not object to our being the authority to supply water to this district. Before going further, I may say that I was under a like misapprehension with respect to what was stated by Mr. Johnson, the Town Clerk, in his evidence. I understood him to claim powers for the Corporation under some local Act, while he simply referred to the Public Health Act of 1875. Under this Act, if the power were given to the Town Council to supply water, they could supply it not only to the borough, but also to the districts immediately adjoining, but these districts are not places immediately adjoining. Any ratepayer might stop them. My friend, Mr. Venables, said that the Corporation were with the Company in their desire to have these districts supplied—that it would be a great benefit—and the formal evidence of the Corporation was to the effect that such a supply is essentially necessary for the sanitary government of the borough. On all hands this is admitted, and the only question is how much money is required for the purpose. You, as the Committee, must decide this. The Company, up to the present, have fulfilled their parliamentary obligations; witnesses have told you that there is no complaint whatever to be alleged against them as to the manner in which they have discharged their duties, and a more admirable supply of pure water under liberal circumstances is not afforded in the country. We stand, therefore, without reproach as a Water Company. What is asked of you, then, in the first place, is to order the transfer of this undertaking to the Corporation; and, secondly, if you do not go so far as to make what I venture to call a precedent, you should take from the interest in the undertaking what they have under the Companies Clauses Act of 1863. Such a course is entirely without precedent; and in the cases brought before you as bearing upon this point—whether in the case of Stockton and Middlesbrough, of Birmingham, or Cheltenham—there was the strong allegation that the Company had not discharged their duties to the public, and that the intervention of the strong hand of Parliament was necessary to stop the alleged misdoing of the Company. I am not going to take up your time by detailing at length the circumstances attending these cases. It will be sufficient to call your attention to the fact that in the Stockton case there was a proposition to take water from the Tees, which was not a fit source of supply, and, at the same time, it was allowed on all hands that the existing supply must be supplemented in some way. But in our case no purer water could possibly be given. In the second case, that of Birmingham, although it was not a case of compulsory sale, it was strongly urged that it was impossible for the Corporation, as a Sanitary Authority, to carry on their duty as a Sanitary Authority, and supply the thousands of houses which were not properly supplied with water; and also that the large expense of providing the great quantity of water, and promoting the compulsory powers of the Sanitary Act, would practically cause a revolution in Birmingham. In Cheltenham there was an acknowledged deficiency of water. The Company asked to bring in a supply of river water, and the Corporation also promoted a Bill. In all three cases people came before the Committee in order to induce them to put pressure upon the Water Company, so as to cause the undertaking to be transferred from the Company to the Corporation. I heard the speech of Mr. Venables in the present case, and I waited in vain for any reason to be stated why the undertaking should be transferred. The only question put before you was a financial one. If you transfer the property, the Corporation say they can supply the water at a cheaper rate. I dispute the possibility, unless you confiscate the property of the Water Company. This is a valuable right of raising capital, and you are asked to overrule it, and transfer the undertaking into other hands, in order that they may reap profit thereby. But if they acquire it compulsorily, they must pay for the worth of the undertaking. It is evident that a very important element in the undertaking is the prospective value. If there is a prospective value in the undertaking, they must pay for that as an essential part of it, and pay for it that which is its value. It is said that at the present time, owing to the natural increase in the revenue arising from this Company, they have an estimated surplus this year or next of £4500, the year afterwards adding £500; but in 12 or 18 years from this time there will be a sum sufficient from the new capital to pay the dividend. What will be the consequence? Within 18 months there must be a diminution in the price of water. But will not that deduction be rather retarded if the proposal put before you is adopted—a proposal which is so extremely liberal; and when a Corporation are liberal, it is wonderful how great their liberality is. They offer to give us a smaller sum than we could get in the market. And if, instead of the profit of 5 per cent., which is now paid, they offer 6 per cent., out of whose pocket is that 6 per cent. to come? Only from the ratepayers. They must charge for the water directly, or take it out of the general district rate; and they both come out of the same pockets. I venture to say that not one single reason, except that they wish it, and that the general feeling of the population of Nottingham is in favour of the transfer of this undertaking, can be adduced. But is it at all wonderful that where great profit has accrued, the general feeling on the part of the ratepayers should be in favour of the transfer, especially as it is not to come from their pockets? There is not a single reason. No complaint can be made as to the conduct of the Water Company. And how is the transfer proposed to be effected? By auction clauses. The argument against these is both positive and negative. When the House of Commons, and subsequently the House of Lords, had their attention specially directed to them, they drew a broad line of demarcation between gas and water works, including one and excluding the other. They did not intend auction clauses to apply to water-works. The exclusion of one matter considered shows they had no intention that auction clauses should be allowed. Up to within the last few years there were three Companies—the Chesterfield, Sunderland, and Nottingham—to which the auction clauses referred. By subsequent legislation, the auction clauses, as relating to Water Companies, have



been removed. On principle, there is a great reason why auction clauses should not apply to Water Companies, although they apply to Gas Companies. Where auction clauses apply to Gas Companies they are accompanied by another provision, that of the sliding scale. The Legislature, in effect, says to them, although we take away from you the power of raising capital, and destroy the interest of the old Shareholder in the future progress of the undertaking, although it is our wish to prevent an undue expenditure of capital, we will give you such inducements as will cause you to be economical with your capital, and so conduct your Company in the future as will place at your disposal an increased profit. There is a difference between Gas and Water Companies in the manner of increasing their profits, for whereas for every additional 1000 feet of gas there is more revenue accruing, the measure of revenue of the Water Company is not the amount of water supplied. The smaller the quantity of water supplied, providing the obligations are properly discharged, so much the better for the Company, and the sliding scale cannot, with justice, apply to water. Increased consumption of gas brings more profit, but in the matter of water an increased number of consumers cannot cause a single farthing more to attach to the revenue; therefore the sliding scale cannot apply. The object of the auction clauses in the case of Gas Companies was also to cause the whole of the capital to be raised at 5 per cent.; 5 per cent. was the ruling amount at which gas property was bought in the open market, but the gas profits were allowed to go to 7 per cent. This Company were permitted to borrow money at 5 per cent., and the object of the auction clauses was to reduce the 7 per cent. to 3 per cent., which in reality was the total amount they could derive from increased capital. Is it too much to ask that a man who has invested his money should be able, owing to the skill he has used in the development of his property, to reap the advantage accruing from any further issue of capital? What is the meaning of the premium at which shares in this Company are quoted in the market? If it is true that a £50 share fetches £78, it is in the first place owing to the fact that it is known that the Company have got a larger amount of property to back it up, and that Parliament, judging from the conduct of the Company in the past, would allow a very natural extension. If the Company had carried on their affairs so badly as only barely to pay 5 per cent., their shares would not have been at a premium in the market. I ask whether any case has been made out against them, and why the Company, having well supplied their consumers, having fulfilled the whole of their parliamentary obligations, having done nothing to call upon them the censure of Parliament—for the transfer would be nothing less than a censure upon the conduct of the Company in the past—why there should be a departure from all precedent, and the auction clauses be inserted, which would have a penalizing effect upon the Company's past action. I ask you to grant such an increase of capital as will permit the Company to undertake an extension of the limits which is admitted on all hands to be desirable, that you will allow them to go on in their course of usefulness, and not do anything to keep them from the operation of the general law of the Companies Clauses Act of 1863, and that in future the Company's capital shall be divided amongst the Shareholders. I ask you to carry out the Legislation of 1874, because this is not the first time the Corporation have attempted to prevent the extension of our works. They come here not able to make one single complaint, and, therefore, I ask you to grant the prayer of the Company, and pass the preamble of their Bill.

The room was again cleared, and, on the parties being re-admitted, The CHAIRMAN said: The Committee find that the preamble of the Nottingham Water Bill is proved. The Committee direct that the auction clauses shall be inserted, and that the capital shall be reduced to £100,000, with the usual borrowing powers of £25,000. The Committee also find that the preamble of the Nottingham Improvement, Gas, and Water Bill is made out, the reference to the purchase of the water-works being struck out.

TUESDAY, MARCH 26.

The clauses of the Company's Bill were proceeded with.

Mr. VENABLES submitted a clause limiting the amount of stock which could be put in the market at one time. He said the Company proposed a clause, which his clients had very little objection to; but they would like to see the powers given by it somewhat restricted. That clause was to the effect that they should be entitled to put the shares up to public auction at such time and in such quantity as they thought fit. What the Corporation wanted was to get the Committee to limit the quantity which should be put up at any one time, and to restrict the sales during the year to a fixed number. The clause he now proposed would enact that stock could not be sold at any one time exceeding the value of £1000, nor at less intervals than three months. He also asked that two more clauses should be inserted in the Bill, one to the effect that the whole nominal value of the stock should be paid to the Company within three months of the date of each sale. This, he thought, would not do the Company any harm, neither would the first clause he had proposed, and they would give his clients a certain amount of security. The clause he wished to have placed in the Bill was to the effect that the Company should not pay out of their profits any larger dividend on the additional capital given by the Bill than £5 in respect of every £100.

The CHAIRMAN said it would be a much better plan for the parties to agree amongst themselves than for him to decide between them, and he would therefore give them a short time so that they might settle the matter.

After an interval,

Mr. VENABLES submitted his clause in an amended form. It provided that the Company should not offer for sale any greater sums than £10,000 or at shorter intervals than two months, until March 5, 1880; and after that not at shorter intervals than three months. The object of this, he said, was to prevent the Directors flooding the market with stock.

Mr. MICHAEL said that in their petition his opponents had only asked that the clauses contained in the Act of 1854 should be introduced into the Bill, but now they wanted the Committee to place entirely new provisions in the Bill. It was the object of this, as it was of every Company, to get as large an amount of premium upon their stock as possible, and, therefore, they would take just the opposite course to that which Mr. Venables wished to guard against—viz., flooding the market. This clause was quite unnecessary, and he would beg the Committee not to insert it.

The CHAIRMAN: Was there a limitation in the Act of 1854?

Mr. MICHAEL: There was not, except such as exists in the present Bill. You will see we have exactly reproduced the clauses of the Act of 1854 in our Bill.

Mr. VENABLES said it was to the interest of the Company that this clause should be in their Bill, and, if they did not wish to increase their security, the Corporation did, and they, therefore, still asked the Committee to insert the clause.

The CHAIRMAN: Is there any objection to the clause respecting the amount of dividends?

Mr. MICHAEL: No; I have no objection to that.

The CHAIRMAN: And is there any objection to the other clauses proposed excluding that relating to limitation?

Mr. MICHAEL: No; I do not object to them either.

The CHAIRMAN said the Committee would allow those four clauses to be

placed in the Bill, but would disallow the fifth, which provided that shares should not exceed £100 each.

The remaining clauses were gone through and settled, and the Chairman was ordered to report the Bills, as amended, to the House.

#### PUBLIC HEALTH ACT (1875) AMENDMENT BILL.

The Select Committee of the House of Commons to whom this Bill was referred have agreed upon the following report:—

1. It will be observed that the Bill proposes, in certain cases, to enforce the provisions of water supply, either (1) on the owners of the occupied houses, subject to certain limitations, or (2) on the district or contributory place, taken as a whole, within which the houses are situated.

The Committee have had several other points of great importance brought under their notice in the course of the inquiry; but not feeling justified in dealing with them in the Bill referred to them, they have agreed to the following report.

2. Suggestions have been made to the Committee by various witnesses, for the amendment of the law, with the following objects:—

1. To enable Sanitary Authorities to take water compulsorily, their power to do so having been called in question.
2. To require a Sanitary Authority to make an equitable charge for the cost of water supply on the property benefited by the supply, instead of charging it on the rates.
3. To regulate the relation of the Water Company or Water Authority with the Local Authority.
4. To make further provision for rural districts from which the Water Companies or Water Authority take the water, or through which the mains pass.

#### I.—Compulsory Powers.

3. The Committee have been impressed with the importance of amending a defect which has been found to exist with regard to the taking of water otherwise than by agreement. From the date of the passing of the Public Health Act up to last session of Parliament it was believed that Provisional Orders could be obtained under the Act, by which water rights could be compulsorily taken.

Several Provisional Orders have been obtained under the belief that the compulsory taking of water rights by Provisional Order was legal under the meaning assigned to the word "lands," the word "lands" being defined to include "messuages, buildings, lands, easements, and hereditaments of any tenure;" and it was thought that, under the definition, a Local Authority could purchase water rights compulsorily under the 176th section of the Act of 1875. During the last session of Parliament a Committee of the House of Lords—when considering a Provisional Order, for the compulsory purchase of water rights under that section, by the Local Board of the West Houghton district—decided that the Order was *ultra vires*, and, consequently, it was not confirmed.

The Law Officers of the Crown were then consulted, and they advised:—"We are of opinion that, in issuing a Provisional Order under the 176th section of the Public Health Act, 1875, the Local Government Board cannot confer upon a Local Authority power to purchase for the purposes of the Act, and otherwise than by agreement, any right to abstract water from any stream."

It follows from this that a Provisional Order which proposes to take water rights otherwise than by agreement cannot be made under the Public Health Act.

4. The Committee are of opinion that this decision will produce serious inconvenience to Sanitary Authorities, for it is apparent that before water from a stream can be taken by a Sanitary Authority for the water supply of its district, an agreement would have to be made with every owner, lessee, and occupier below the proposed intake, who may be affected by the abstraction of the water. The statement of the case is sufficient to show how difficult it would be to obtain the consent of those having these water rights.

A Sanitary Authority could still obtain compulsory powers by a private Bill, but it has been pointed out that the cost of obtaining a private Bill is much higher than that of obtaining a Provisional Order.

5. The Committee, therefore, recommend that, with the view of affording to Local Authorities facilities for acquiring the right to take water from any stream, the Local Government Board should be empowered to issue Provisional Orders which, on confirmation by Parliament, would confer powers on the Local Authority for the purpose.

The Committee are of opinion that the Provisional Order should incorporate the Water-Works Clauses Act, 1847, in the same manner as is usual in a private Bill, but prior to the Provisional Order, the notices, which, in the case of a private Bill, would be necessary under the Standing Orders of Parliament, should in all cases be published and served by the Local Authority.

The Committee have had a clause laid before them, which will be found in the Appendix, in the paper handed in by Mr. H. Owen, and which they recommend to the attention of Parliament.

[The clause referred to, which is of some length, provides for the incorporation of the Water-Works Clauses Act, 1847, in this Bill, with respect to the construction of works, and also a provision for empowering Local Authorities, notwithstanding the Public Health Act, 1875, to "take, divert, collect, impound, and appropriate such of the waters of any stream, whether within or without their district, as they may require for the purposes of water supply," for the purpose of any water-works which may have been constructed, or which may be proposed to be constructed by them. Before, however, doing so, they would be required to give certain notices in the local newspapers, and to the owners, and lessees, and occupiers of mills, factories, and other works using the waters of the stream for a distance of 20 miles below the proposed intake. They would then petition the Local Government Board, by whom a local inquiry, if thought fit, would be made, and who, thereupon, would issue a Provisional Order giving the power of appropriation to the Local Authority.]

#### II.—Equitable Incidence of Water Charges.

6. The Committee have had pointed out very forcibly to them that the prevailing practice with regard to defraying the costs of a water supply, does not appear to meet the equity of the case. At present a Sanitary Authority may recover the cost of the water supply in either of the following ways:—

1. They may charge the whole cost upon the rates, in which case it is paid out of the rate for special expenses; or
2. They may defray the cost by water-rates and water rents upon the consumers of the water. These charges may be insufficient, sufficient, or more than sufficient, to meet the costs of water-works. If they are insufficient, the rates have to make up the deficiency. If they are more than sufficient, the rates will be lightened by the surplus revenue derived from the water-works.

7. It appears to the Committee that grave evils result from this state of things. It frequently happens, notably in rural districts, that the whole charge is borne by the parish, under the rate for special expenses, while the supply of water is limited to the village, or a particular part for the parish.

Those, therefore, who live outside the village, or the part of the parish



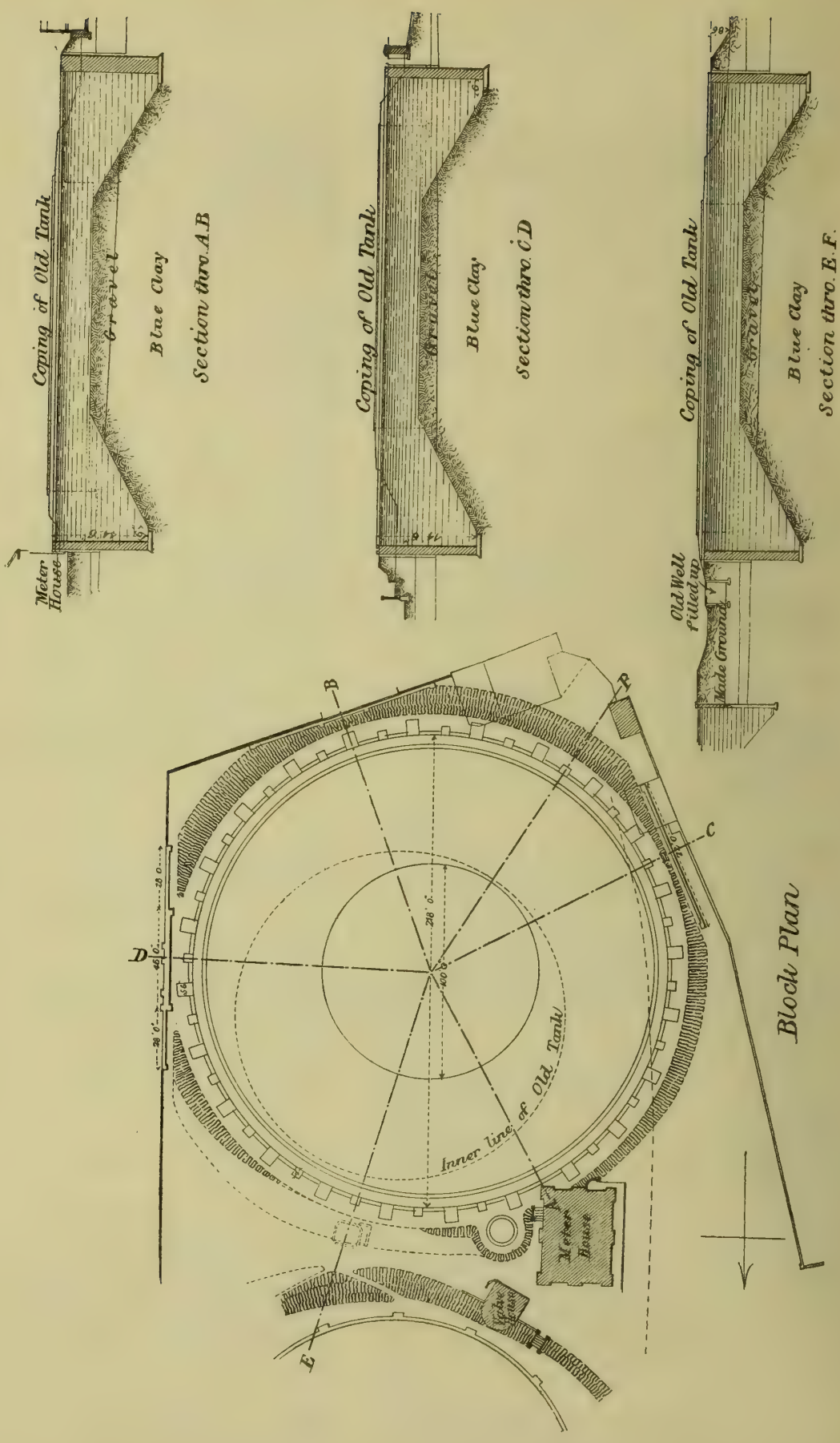




PHOENIX GAS COMPANY—KENNINGTON LANE STATION.

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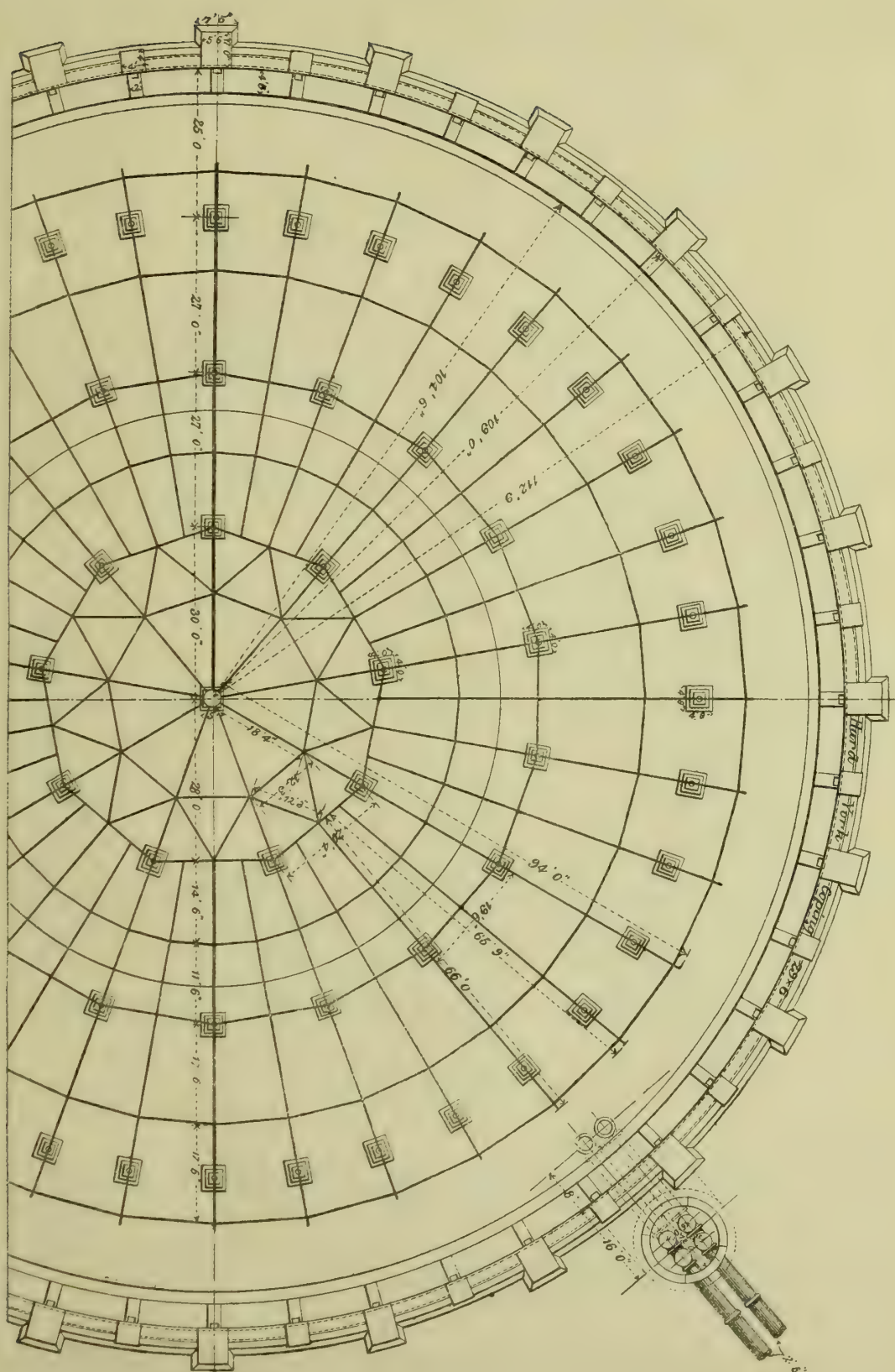
GASHOLDER TANK, 218 FEET DIAMETER, 44 FEET DEEP.





PHENYL GAS CHROMATOGRAPHY-MASS SPECTROMETRY

GASHOLDER TANK, 218 FEET DIAMETER, 44 FEET DEEP.









benefited by the supply, have to pay for the water, from which they may derive no advantage. This fact causes great opposition to schemes for water supply, and in many cases renders it impossible to carry them out.

Special districts for drainage and water supply have been in some cases formed; but objections are often raised to the formation of new rating areas, and in some cases special difficulties arise. For instance, when in a village some of the houses have water, and some have not, and when these two classes of houses are intermingled.

8. On the other hand, there are cases where the Sanitary Authority charge water-rates and water-rents, but the revenue from them is insufficient to defray the cost. Here it is obvious that the cost of the water to the consumer is lightened at the cost of the rates. To illustrate this, suppose a case of a manufacture being established in which large quantities of water were used, it would be the interest of the manufacturer to have the water cheap, and the deficit of the water account thrown on the rates.

In this case, again, those who do not benefit by the supply pay for those who do.

Where, however, the price charged for the water is more than the cost of the supply, another grievance arises—viz., that the rates are lightened at the cost of the consumer of water. If a large ratepayer were not a large consumer of water, it would be his interest to have the total amount to be raised by rates lightened by the surplus profit derived from the water-works.

9. The Committee, after full consideration of these cases, think that the sound principle to lay down is, that water supplied by a Sanitary Authority should be paid for by the consumer; but as it appears that this principle, if carried out to its full length, might, in some cases, cause the charge for water to be very high, it seems desirable that a maximum of charge on the consumer of water should be established.

On the other hand, it has been shown to the Committee that it is desirable to establish a minimum.

It is obvious that a fair charge made directly on the houses benefited will tend to disarm the opposition which now arises on the ground that the cost of the water-works will be thrown on the rates.

10. The Committee have had two suggestions made to them, which, although they differ as to the means, agree as to the principle.

One witness—Mr. H. Owen—suggested that the Local Government Board shall have power to establish the maximum and minimum of charge on the application of ten ratepayers of the district.

The other witness—Colonel P. Cox, R.E.—suggested that a maximum and minimum should be laid down in an Act; and for that purpose he proposed that 6d. in the pound on the rateable value of the house should be the minimum, and 2s. in the pound the maximum. It may be observed that the maximum of 2s. in the pound on a cottage rated at £4 per annum is less than the sum of 2d. per week, or 8s. 8d. per annum; and the minimum of 6d. is less than 3d. per week. Further information on these two suggestions will be found in the paper handed in by Mr. H. Owen, and in the paper handed in by Mr. Pell, a member of the Committee.

11. The Committee recommend the adoption, in an Act of Parliament, of the maximum and minimum suggested by Colonel Cox. The necessity for this suggestion will be found in the evidence given in reply to questions 918 to 922.

[The four clauses suggested by Colonel Cox were the following:—

"Where the Sanitary Authority has established works of water supply for their district, they shall keep a separate account of all their receipts, credits, payments, and liabilities from or on account of the water-works undertaking, to be called 'the water account,' which account shall be subject to the same provisions as to audit, examination, report, inspection, copies and extracts, and production of vouchers, as other accounts of the Local Board."

"All moneys from time to time received by the Local Board by way of revenue on water-works account shall be applied for the following purposes: 1. In payment of the water-works establishment charges—that is to say, of the expenses properly chargeable to revenue of establishing, conducting, managing, and maintaining the water-works, and works connected therewith. 2. In payment of the interest on the moneys borrowed for the purposes of the water-works. 3. In providing for the discharge of any moneys borrowed for the construction of the works. And the balance, if any, shall be carried to the district-fund or to the credit of the rate for general expenses; but no balance shall be so carried in any year in which the price charged for water exceeds a rate of 6d. in the pound."

"In case the revenue of the Local Board from the water-works undertaking shall in any year be insufficient for the payment of the moneys payable in respect of the same, and chargeable on revenue, the Local Board may in such year, according to the powers and provisions of the Public Health Act, 1875, make and levy a general district rate, to be called 'the water-works rate,' for providing for the deficiency; but such rate, or any part thereof, shall not be levied in any year in which the charge for water is less than a rate of 2s. in the pound."

"For the purpose of diminishing the expense of assessing, making, levying, and collecting 'the water-works rate,' the Local Board may include the same in any general district rate under the Public Health Act, 1875; and may make, levy, collect, and recover such water-works rate as part of any such general district rate."

### III.—Supply by Water Companies or Corporations.

12. The Committee have also had their attention called to several questions which arise under section 52 of the Act of 1875. That section appears to be somewhat ambiguous. Its effect is to restrict a Local Authority from providing a water supply when within the limits of supply of a Water Company.

A Water Company often have a district assigned to it, which includes outlying places to which its mains do not at first extend, although it is contemplated that they will do so at a future time. To give to a Water Company the power of supplying a certain district with water, to the exclusion of all others, is to give a power which ought to be exercised within a reasonable time, or else some other body should be found to provide the water, which, in many cases, is urgently wanted.

At present the law says that if the inhabitants of a district within the limits of supply of any Water Company or other Authority which has been appointed to supply the water, will guarantee 10 per cent. for three years of the cost of the mains and pipes to be laid down by the Water Company or other Authority, then the latter shall be compelled to lay down the mains and provide a water supply. Doubts have been expressed as to whether the Sanitary Authority could give the guarantee required, in place of the inhabitants, and charge the same on the rates.

13. It would appear that the words of sub-section 3 of section 51 of the Act of 1875 are wide enough to cover the case; for it says that "a Local Authority may contract with any one for the supply of water." But if there is any doubt about the matter it ought to be removed. Mr. Easton, the witness who raised this question, also pointed out the importance of not limiting the guarantee to three years, but of allowing the Authority to give it until the water rates and rents from the district were sufficient to pay the Water Company the proper return on the cost of the mains and pipes which it laid down, and in that case the guarantee should not be 10

per cent., but 7 per cent. This point also is one which appears to deserve careful attention.

14. With respect to section 52 it has been stated in evidence that "doubts have arisen as to the construction of the section in cases where Local Authorities have been desirous that the Company should exercise these powers, either by themselves supplying the place with water, or by supplying the water to the Local Authority in bulk with the view to their distributing it, or that the Local Authority should themselves execute the necessary works of water supply." (See "Mr. Owen's Memorandum of Suggestions," p. 122. "Construction of Water-Works by a Sanitary Authority within the Limits of Supply of a Water Company.")

A suggestion has been put forward by Mr. Owen which will be found in the paper handed in by him. The object may be shortly stated as follows:—Where a district within the limits of supply of a Water Company is unsupplied, the Local Authority may require them to determine whether they will allow the Local Authority to supply, or whether they will supply the district with water themselves, or supply water in bulk so that the Authority may distribute the water.

If the Company inform the Authority of their willingness to supply, they are to name a period before the expiration of which they will supply the district; and then they retain their right to supply, to the exclusion of the Local Authority.

If the Company determine to supply the Local Authority in bulk, they shall state the price, the quantity, and condition of the supply.

Provision is made for referring to arbitration any dispute which may arise as to the reasonableness of the time within which the supply is to be provided, if the Water Company provide the supply, and also as to the price, quantity, and condition, if the Water Company agree to supply the Authority in bulk.

If, after an arbitration, the Company decline to supply, then the Local Authority may supply, as if the district were not within the limits of supply of a Water Company. Further provision is made that, if the Local Authority is supplied in bulk they may distribute the water, and also if the Water Company fail to do what they have undertaken, then the Local Authority may supply the district as if it were not within the limits of supply of a Water Company.

The same regulations which apply to a Water Company should apply to any Corporation supplying water.

15. The Committee, bearing in mind that many places within the limits of supply of Water Companies are unsupplied, think that these propositions are reasonable, and, therefore, recommend them to the attention of Parliament.

### IV.—Water Supply to Rural Districts in Certain Cases.

16. The Committee have had their attention drawn to the fact that a Rural Sanitary Authority have not the power to oppose by Counsel a Bill in Parliament, by which it is proposed to take water from their district though they can petition against it.

An Urban Sanitary Authority, on the other hand, can oppose by Counsel a Bill, subject to the conditions laid down in the Municipal Corporations (Borough Funds) Act; and it has been suggested to us that a Rural Authority should have the same power.

The Committee, however, do not approve of that course; but it does appear right that some remedy should be found whereby the wants of any rural district from which a water supply is to be taken for some large town should be considered, before the Act or Provisional Order authorizing the supply to be taken is passed by Parliament.

It also appears that the wants of the rural districts through which the proposed water-main will pass should also be considered by Parliament before the works are sanctioned.

17. The Committee therefore recommend that where a Water Company or Sanitary Authority go to a rural district for water, or where their mains pass through a rural district which is in want of water, they shall be compelled to supply the Rural Sanitary Authority of that district with water in bulk, at a cost which, failing agreement, should be settled by arbitration. The Rural Sanitary Authority in that case should generally undertake the distribution of the water.

In order that Parliament may have full information as to the wants of any rural district from which the water is to be taken, and through which the proposed water-main is to pass, a report should, in all cases, be made to Parliament by the Local Government Board, which, following the practice of Parliament, would be referred to the Committee who are charged with the examination of the Bill or Provisional Order, by which the powers are given.

The report should state—

What are the probable wants, as regards water supply, of the district from which the supply is to be taken, and of the districts through which the mains pass;

Whether it is necessary for the districts to obtain a supply from the proposed works; and

Any other information which it is important for Parliament to know.

These provisions, if carried out, would, in the opinion of the Committee, help to solve the problem of water supply which is now attracting such great attention.

### V.—Summary of Recommendations.

18. The Committee recommend that the Local Government Board should have power to issue Provisional Orders, which, when confirmed by Parliament, would confer upon the Local Authorities the power to purchase water rights compulsorily, such Provisional Orders to put in force the Water Clauses Act, 1847.

That in all cases where the Local Authority provide a water supply, water-rates or water-rents should be charged upon the consumers; the maximum of charge to be 2s. in the pound on the rateable value of the house, and the minimum 6d. in the pound.

That a Sanitary Authority should have power to guarantee 10 per cent. for three years of the cost of the mains and pipes to be laid down by the Water Company, or 7 per cent. until the water-rates and water-rents are sufficient to pay the Company the proper return on the cost of the mains and pipes.

That section 52 of the Act should be made more explicit.

That where a Company or Corporation go to a rural district for water, Parliament, before giving the powers sought for, should be informed of the wants of the district from which water is proposed to be taken, or through which the main passes, in order to make provision for these districts.

REDUCTIONS IN THE PRICE OF GAS.—At the meeting of the Leeds Town Council on Wednesday, the 5th inst., it was resolved to reduce the price of gas from 2s. 9d. to 2s. 6d. per 1000 cubic feet, to take effect from the 1st of July, the same discount being allowed as at present—viz., 2½ per cent. on all accounts paid within one month of the date of delivery. The Directors of the Runcorn Gas Company, at their meeting on Thursday last, decided to reduce the price of gas 4d. per 1000 cubic feet, on and after the 1st of July next. This reduction is the second during the present year, the last having taken effect on the 1st of January last. The price is now 4s. 2d. per 1000.



Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

TUESDAY, JUNE 4.  
(Before Vice-Chancellor MALINS.)

GLOSSOP v. HESTON AND ISLEWORTH LOCAL BOARD.

This case, which has been so frequently before the Court, again came on to be argued to-day.

Mr. GLASSE, Q.C. (with him Mr. STURGES), reminded the Court that the writ in the action was issued so far back as July 12, 1876, from which time, notwithstanding all the efforts made, the plaintiff had been unable to get rid of the nuisance of which he complained, or to obtain a decree that the defendants should find some mode of relieving him from it. He asked to restrain the defendants, by injunction, from permitting sewage or other offensive matter to pass into the River Crane in such manner as to render the water in the river, at or near the plaintiff's residence, unfit for use, or injurious to the health or comfort of the plaintiff and his family there. It had long been settled that the fact of a stream being fouled by others was no answer; and the Court would restrain any new communication, suspending the operation of its order for a greater or less time, as it thought fit. When the case was last before the Court, his lordship had selected Lieut.-Col. Hope to make an inspection on the spot, and report to the Court thereon. That gentleman had so inspected, and now reported that the river was in such a state as materially to interfere with the comfort and enjoyment of the plaintiff's residence, and that this condition arose from the sewage or other offensive matter now flowing into the river through the drains or channel under the defendants' control. Reference was then made to the cases of *Attorney-General v. Birmingham*; *Attorney-General v. Leeds*; *Goldsmidt v. Tunbridge Wells*; *Stokes v. Banbury*, and the Public Health Act; and it was contended that the plaintiff was entitled to the order asked, with the costs of the suit up to the hearing.

His LORDSHIP: I do not want to hear this case all over again. I have heard it twice. I retain the opinion I before expressed, that Mr. Glossop has sustained injury, which opinion is confirmed by Colonel Hope's report, and by the defendants own minutes which amount to an admission of nuisance.

Mr. HIGGINS, Q.C. (Mr. METHOLD with him), proceeded to argue the case for the defendants, characterizing Colonel Hope's report as a document of great ingenuity and considerable eloquence, but, taken as a whole, of little practical value, because he only paid two visits to the *locus in quo*—on one of which, a week day, he discovered no nuisance; on the other, a Sunday, a *dies non*, he could do so.

His LORDSHIP said he thought it would be better to make an order, following the decision in *Attorney-General v. Leeds*, granting an injunction, leaving the defendants to find a mode of obeying it. The question would then be what time should be given the defendants.

Mr. HIGGINS reminded the Court that the drains referred to had existed 50 years, and that the increase of population during that time had only been from 5000 to 10,000.

His LORDSHIP said he could see very well that Mr. Glossop had not a perfectly pure stream now probably he had not had it for 40 years—but whether the defendants were responsible for it, and could abate it, he did not know. Granting the injunction, he would give the defendants time.

Mr. GLASSE said he was ready to take an order refusing the injunction, and upon that go to the Court of Appeal.

His LORDSHIP, however, said he was bound to make the order most in accordance with his views, and, therefore, he would grant the injunction, giving a delay of six months, with liberty to apply. Costs of the suit to include costs of motion, and what was properly paid to Colonel Hope.

Miscellaneous News.

SOUTH METROPOLITAN GASLIGHT AND COKE COMPANY.

An Extraordinary General Meeting of Shareholders was held on Monday, June 3, at the Terminus Hotel, London Bridge—T. B. SIMPSON, Esq., in the chair—"for the purpose of increasing the number of the Directors of the Company by the appointment of an additional Director, and to confirm the resolution passed at the last half-yearly meeting for increasing the remuneration of the Directors."

The SECRETARY (Mr. George Livesey) read the advertisement convening the meeting, an extract from the minutes of the last general meeting, bearing on the matters of the present meeting, and the legal opinion which the Directors had taken as to the proposed increase in the number of the Directors, which it was stated, for various reasons, was a perfectly valid proceeding.

The CHAIRMAN then said: Gentlemen, the remarks which our Secretary has just read will obviate any necessity on my part to introduce the matters for your consideration. We have met for the purpose of carrying out the resolution which you so properly passed on the former occasion. We thought it safer—although I myself had no doubt of it previously—to take that sort of opinion which all the Proprietors would be contented to receive. Our Secretary has read to you the opinions so obtained. On this occasion, too, we have our Solicitor with us, and if any gentleman has any doubt, or question to ask him, I am quite sure he will be ready to state to you what his opinion is, or give you an answer to any other legal question which you think you are entitled to ask. In order to save your time, I think I may at once say that we have met first of all to carry out the intention of electing a Director, and, if you please, we will proceed to that at once. I shall now be pleased to receive any proposition. I believe there is one candidate.

Mr. BUTLER said he did not understand the legal bearings of the case; but he thought that the Solicitor—whom he begged to thank—had given such reasons as would commend themselves to the common sense of the Proprietors; and he thought they could have no difficulty in electing a sixth Director, and as many more hereafter as they might wish. He moved—"That the number of the Directors of the Company shall be increased from five to six."

Sir CHARLES D. CROSLY felt quite sure that none would regret the step that had now been taken in increasing the number of Directors from five to six. Although they had a very able body of gentlemen now managing their affairs—and he was quite sure they were all most grateful to them for the manner in which they had conducted matters—nevertheless, he thought that in an important Company like this, which was second to none—indeed, it ranked highest of all the Gas Companies as to management, as was seen by the extra dividend the Proprietors were getting—none would regret increasing the number of the Directors, because there were times when the Directors were absent through unforeseen circumstances—through illness, or from other causes; and there might be important business to attend to at the Board. He believed, too, that "in the multitude of counsellors there is wisdom." He had much pleasure in seconding the resolution.

The resolution was then put and carried unanimously.

Mr. BUTLER said the only candidate was Mr. Simpson Rostron, and he had great pleasure in proposing that gentleman. He had been a large Shareholder for some years past; he was a man of considerable ability, and he could not help thinking that he would be an acquisition to the Board. It was a very nice thing for the Directors to feel that they could now and then leave their posts, and that there was a sufficient number to carry on the business of the Company without any detriment. He had great pleasure in proposing Mr. Rostron.

Mr. HARRISON seconded the resolution, which was carried unanimously.

Mr. BUTLER then moved—"That the remuneration of the Directors of the Company be increased to £1500 per annum from the 1st of January last, and to £1800 per annum from the 3rd of June, 1878." He thought he need hardly repeat what had been said on so many occasions as to the debt of gratitude which the Shareholders felt to the Directors. It had been without doubt one of the best managed of the Gas Companies in this country, or any other, and they felt deeply indebted to the Directors. He only hoped that they would be as prosperous in the future as they had been in the past.

Mr. HARRIS seconded the motion, and briefly expressed the very great pleasure he felt in doing so.

The resolution was carried unanimously.

The CHAIRMAN, in reply, said: Gentlemen, I am sure I thank you sincerely on the part of the Directors, and those who follow me will see the increase with pleasure. I think it is a very liberal sum, and on their part, as well as on my own, I thank you for this courteous proceeding, for which we must be grateful.

Mr. ROSTRON, who then took his seat at the Board table, said: Mr. Chairman and gentlemen, it is now my duty, and also a pleasure, to rise and thank you for the very cordial way in which you have received my name, and also for the very unanimous manner in which you have elected me a Director of this Company. I wish to take this opportunity of thanking publicly those Shareholders who are not here present to-day, but who have in the very kindest way either sent me their proxies before it was known whether there would be a contest, or who have written to me expressing, in the very kindest terms, their wishes for my success. Among those who have done so are many of the largest Shareholders, both ladies and gentlemen. I can assure you that the confidence expressed in me was unexpected, but I attach a very high value to it, and its exhibition is most gratifying to me personally. You will not expect me to say anything of the policy of the Company on this occasion, beyond stating that the policy which has given us success in the past will not fail us in the future. All that remains for me to say, in conclusion, is that although I know that there are others whose holdings are much larger than mine, and who are older Shareholders, yet I enter office with the full determination and desire to do my duty, and to do so by finding out, and then promoting what I consider the real interests of this Company.

Sir CHARLES D. CROSLY proposed, and Mr. MALBY seconded, a vote of thanks to the Chairman.

The motion was unanimously agreed to, and having been acknowledged, the proceedings terminated.

PHOENIX GASLIGHT AND COKE COMPANY.

An Extraordinary General Meeting of Shareholders was held on Wednesday, June 6th, at the Offices, 70, Bankside—J. SHAND, Esq., in the chair—"for the purpose of making a call of 10 per cent. on the new stock, payable on the 1st of July next."

The SECRETARY (Mr. I. A. Crookenden) having read the advertisement convening the Meeting,

The CHAIRMAN moved the following resolution:—"That a call of £10 per centum on the new stock be made upon the several Subscribers and Proprietors of this undertaking, according to their registered amount of that stock, and that such call be paid into the hands of the Treasurer, Robert Cooper Lee Bevan, Esq., at 54, Lombard Street, E.C., on or before the 1st day of July next."

Mr. LEONARD SHUTER seconded the resolution, which was carried unanimously.

The proceedings, which were purely formal, then terminated.

METROPOLIS GAS SUPPLY.

CHELSEA VESTRY.—At the meeting of this Vestry on the 4th inst., a letter was read from the London Gas Company, with reference to the existence of carbonic acid in their gas, as alluded to in the report of the Vestry's Gas Examiner. The Company stated that the existence of carbonic acid is not referred to as an impurity in any of the Acts of Parliament, but that they and every Gas Company would be happy to be rid of it, could they do so without nuisance to the neighbourhood. Dr. Barclay said that, although the presence of carbonic acid gas was not referred to in the Act of Parliament, it was none the less an impurity, diminishing the illuminating power of the flame of gas in proportion to its presence. The gas of the London Gas Company contained a much larger proportion of carbonic acid than usual. As far as he could remember off-hand, every 5 per cent. of carbonic acid caused a diminution of one candle in the illuminating power of a gas flame. Dr. Barclay was requested to present a written report on the subject. The Board also resolved to instruct their Solicitors to take measures for observations to be kept on the gas nuisance at Fulham from June to November.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health, on the Composition and Quality of the Metropolitan Waters in May, 1878:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen Nitro- required gen- by Organic As Ni- Matter, trates, &c.		Ammonia.		Hardness (Clark's Scale).	
				Sa- line.	Or- ganic.	Before Boil- ing.	After Boil- ing.
<i>Thames Water Companies.</i>	Gras.	Gras.	Gras.	Gras.	Gras.	Degs.	Degs.
Grand Junction . . . . .	19.40	0.066	0.120	0.000	0.009	13.2	2.8
West Middlesex . . . . .	19.20	0.084	0.120	0.000	0.010	13.2	3.3
Southwark and Vauxhall . . . .	19.00	0.077	0.135	0.000	0.009	13.2	3.3
Chelsea . . . . .	18.40	0.056	0.135	0.000	0.007	12.6	3.7
Lambeth . . . . .	20.60	0.063	0.156	0.000	0.006	13.7	2.8
<i>Other Companies.</i>							
Kent . . . . .	32.00	0.001	0.450	0.000	0.001	20.6	7.5
New River . . . . .	17.60	0.024	0.144	0.000	0.005	12.6	3.7
East London . . . . .	18.10	0.049	0.135	0.000	0.007	12.1	3.3

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases.

C. MEYMOTT TIDY, M.B.



## PHOENIX GAS COMPANY'S NEW GASHOLDER.

The accompanying engravings are the first of a series which it is intended to publish, exhibiting plan and details of construction of the new large gas-holder in course of construction for the Phoenix Gas Company, on their premises in Kennington Lane, in the parish of Lambeth, from the designs, and under the direction of their Engineer, Mr. Corbet Woodall, M. Inst. C.E., who is also the President of the British Association of Gas Managers for the present year. The holder will be 215 feet in diameter, in two lifts of 44 feet each, and its capacity 3,100,000 cubic feet.

The size of this holder was determined by the exigencies of space. The ground upon which it is being erected was purchased by the Phoenix Gas Company in 1847, from the Southwark and Vauxhall Water Company, who had previously used it as a pumping and storage station. In that year the Phoenix Company erected their first holder upon this site, and since that period the premises have been gradually occupied by other holders, until there was left room sufficient only for one of comparatively small size.

When the Gas Company acquired the property, there were two reservoirs on the ground, which had been constructed by their predecessors—the Water Company—and one of these, 152 feet in diameter and 18 feet deep—was selected as suitable for the erection of the first gasholder, which was a double-lift one, and had a diameter of 150 feet. Although this holder was in every respect well built, its proportions were so radically faulty that it was a source of constant anxiety while working. A heavy wind, or any slight obstruction to the inner lifts, would cause it to tilt on one side, and the carriages and guides were several times broken in consequence.

It having lately become necessary for the Company to increase their storage capacity, it was determined to replace the original holder by one of much larger capacity, and the old one was consequently removed last year. It will be seen from this that the storage room of the Company is not increased by the whole capacity of the new holder, but by the difference between it and that of the one displaced, the gain being 2½ million cubic feet.

The contract for the erection of the new tank provided that, when completed, the tank should be a true cylinder, 218 feet in internal diameter, and 44 feet 6 inches deep from the top of the coping-stone to the top of the footing, the latter being 2 feet deep, and the total depth of wall 46 feet 6 inches, except at positions where connecting-pipes are carried through the wall, where it is taken down to the depth shown in drawing No. 3.

In making the necessary excavation, a trench of uniform width was dug, sufficient to allow of the building of the wall and piers—i.e., with a radius on the outside of 117 feet, and on the inside of not more than 105 feet, carried to a depth of 26 feet 6 inches from the datum line, which datum was 2 feet above the level of the finished coping. Below that depth to the bottom of the trench, the outside radius was reduced to that of the outside of the tank wall—viz., 112 feet 9 inches, a level bench being formed where the width was altered.

From the bench to the bottom, timber chases, or "set-offs," were excavated on the outside of the trench, so as to admit of the building of the piers or counterforts, and at the level of the footings both of the wall and piers, all round the tank, the trench was excavated to a further width of one foot, to provide for the widening of the foundation. In the position shown on the drawings, a chamber of the size and to the depth marked was excavated to admit of the construction of the pipe-well, the timber in this chamber or recess being left in from the bottom up to the level of the concrete floor, where the brick well commences.

The depth to the bottom of the trench, measured from datum line, is 48 feet 6 inches, and the bottom was completely finished to a perfect and uniform level before the erection of the wall was commenced. After the erection of the tank wall, the earth inside was removed, so as to form a mound of the shape and dimensions shown in the drawings, the surface of the mound being cut and finished perfectly smooth.

The general dimensions of puddle are as follows:—Surrounding wall and intermediate piers, and sides of principal piers above the bench in the excavation, 2 feet thick at bottom, diminishing to 1 foot 6 inches at top; behind the principal piers, above the same line, 1 foot thick, or any greater distance required to fill in between the pier and the side of the trench, there being no other backing behind the piers. Except where otherwise provided, the puddle in no place is less than 1 foot 6 inches thick. The whole of the excavated space round the pipes inside the tank, and the whole excavated space outside the tank, to the level of the concrete foundation of the brick wall is filled solidly with puddle. From the concrete foundation to the surface, the whole space between the walls of the well and the tank is filled with puddle, and the remainder of its circumference is surrounded with puddle 1 foot 6 inches thick. The bank round the tank is carefully built up in horizontal layers of 1 foot deep, and was brought up regularly as the well approached completion, so that the puddle should be properly backed up. When the surface of the bank is finally finished, it will have a uniform slope, and be covered with garden mould, and prepared for sowing with grass seed. A gravel path round the tank will be made after the gasholder is completed. The path will finish against a tile edging, with rounded top tiles 7 inches deep, and 1½ inch thick.

(to be continued.)

## THE THIRLMERE WATER SCHEME.

At the Meeting of the Manchester City Council, on Wednesday last—the Mayor (Alderman Grundy) presiding—the following report, prepared by the Town Clerk, with reference to the proceedings before the Examiner in the House of Lords on the Thirlmere Bill, and the subsequent refusal to suspend the Standing Orders of the House, was read:—

"As the Council are aware, the Examiner in the House of Lords has reported that, in the case of the Thirlmere Bill, the Standing Orders had not been complied with, inasmuch as the notice published in November last contained no reference to the clauses 58 and 59, which were inserted in the Bill in pursuance of the instructions given to them by the House of Commons, by the Select Committee to which the Bill was referred; and the Council will also have heard, and no doubt with much surprise, that, upon appeal to the Standing Orders Committee of the Lords, over which Lord Redesdale presides, their lordships determined that the Standing Orders could not be suspended, or the Bill allowed to proceed. It was contended, on behalf of the Corporation, before their lordships Committee, with truth, but unfortunately without effect, that the insertion of the clauses was the act of the Select Committee in pursuance of the instructions given to them by the House of Commons; that such clauses were not sought for or desired by the Corporation, but were actually imposed upon them by the Committee; that not being at that time either desired or contemplated, they could not possibly be referred to in the notices published in November; and, further, that no living being except the Corporation could by any possibility be prejudicially affected by the clauses, or damaged by the want of notice, as the only effect of the clauses was that a portion of the water to be obtained by the Corporation from Thirlmere might, under certain circumstances, if desired by the Local Authorities, be claimed for the benefit of other districts. It is lamentable to think that, as the consequence of

undue regard, as it appears, to mere technicalities and form, all the time and money spent by the Corporation in promoting this important Bill will, to a large extent, be thrown away, and not as the consequence of any act or default of the Corporation, but of something done, in the supposed interests of the public, by the House of Commons. It is at any rate satisfactory to believe that, if obliged to wait until the next session, the Corporation may then reasonably expect to receive the support of the Government and of the House of Commons. The Town Clerk is not able at present to report as to the possibility of the decision of the Lords Committee being reconsidered, but it is in his opinion not probable that any further steps will be taken with that object."

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of this district shows no sign of improvement, and business, apart from the generally depressed condition of the market, is naturally being affected by the advent of the Whitsuntide holidays, advantage of which will, in the Manchester district, be taken to close the majority of the pits for the whole of the week.

With regard to the gas coal trade, the amount of business doing is only limited, as it is still very difficult to place contracts, except at extremely low prices, and for long forward deliveries. The impression in some quarters is that Gas Companies, in many cases already pretty well bought for their present requirements, are simply endeavouring to take advantage of the exceptionally depressed condition of the market to secure contracts with long delayed deliveries at very low figures, and that therefore they are independent about closing, except on pretty much their own terms. Of course it is only natural that Gas Companies should endeavour to profit by their experience of the coal famine prices, and as there are not a few colliery proprietors who, either from necessity or want of confidence in the future, are willing to enter into contracts at very low figures, forward supplies have in some cases been secured on what will probably prove to be very advantageous terms. Many of the large firms, however, are holding back for the present, as they are not disposed to enter into engagements except at what they consider to be fair prices.

In other classes of fuel there is no material change, the reduced prices, which, in the majority of cases, had been fully discounted before, having had no perceptible effect upon the market. The demand both for house coal, steam and forge coal, and engine classes of fuel is still very limited, and, so far as prices at the pit mouth can be quoted, they may be given at about 10s. for best Wigan Arley, 8s. to 8s. 6d. for second qualities, 7s. to 7s. 6d. for Pemberton four-feet, 5s. 6d. to 6s. for common coal, 4s. to 5s. for burgy, and 2s. 9d. to 3s. 6d. per ton for ordinary slack.

The colliery proprietors in the Manchester district have reduced the wages of their men about 10 per cent., and this is generally being submitted to without opposition.

At a meeting of miners delegates held in Manchester, on Tuesday, a new miners union was formed, with the name of the General Amalgamated Association of Miners, under the leadership of Mr. T. Halliday.

The iron trade of this district continues in a very inanimate condition, the inquiry either for raw or manufactured iron being extremely small; but prices nominally are without change from last week.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The exportation of Durham coals from the Tyne Dock during last week was 30,000 chaldrons, which was about 2000 chaldrons in excess of the week before. A good few of these coals were gas. The shipments of steam coals were very good, too, from the Northumberland side, and there were proportionate exports from the Wear and Hartlepool. It can hardly be said, however, that prices are maintained. The highest figure realized for gas coals in the open market cannot be said to exceed 7s. per ton; and 5000 tons of an excellent medium quality of gas coals, from a colliery which stands well in the market, were bought last week at 6s. per ton net. Second-class gas collieries continue to work very badly.

The coasting shipping trade favours shippers. Rates are low to every part of the British Isles, and are equally flat for France, Hamburg, Holland, and the Scandinavian ports. Some ships were engaged last week to carry gas coals to Ireland at a very moderate rate of freight. There were a good few small coasting vessels in the market last week, which it seemed almost impossible to fix at any price. Steamers freights are likewise lower to the Baltic, Cronstadt, and the Mediterranean. There was a drop of nearly £1 per keel last week.

The iron, chemical, and general manufacturing trades of the North are beginning to feel a little favourable reaction. There is no material improvement in prices, but the tone of trade is better. Foreign merchants—with the fact that England and Russia are now to submit their differences to a Congress—are more disposed to buy goods at the present rates, and some few elements of speculation begin to show themselves. Of course, the whole affair is extremely small, but the slightest improvement in business, after so long and painful a depression and heavy losses in the great staples of the Northumberland and Durham industry, are looked upon with satisfaction.

The labour market is quiet. The union joiners of Shields are striking against a reduction of wages, but the market is so full of skilled labour that they are being replaced with non-union men very rapidly.

## TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

At the annual general meeting of the Melrose Gas Company, last Tuesday, a dividend of 10 per cent. was declared for the past year, and the price of gas was reduced 5d. per 1000 cubic feet—i.e., from 6s. 8d. to 6s. 3d.

It is stated that Mr. A. F. Wilson, gas engineer, London, has been appointed by the Directors of the Kirkintilloch Gas Company to act on their behalf in the reference between them and the Gas Commissioners in the transference of the undertaking of the Company under the Scotch Gas Act.

At the last ordinary monthly meeting of the Town Council of Helensburgh, the Provost intimated that he was desirous that those members who were of his mind should sign a requisition to call a special meeting with the view of considering the propriety of adopting the Burghs Gas Supply (Scotland) Act.

The annual meeting of the Kettle, Freuchie, and Kettlebridge Gaslight Company was held on Thursday week, when the report submitted showed that the affairs of the Company were in a very healthy state. Various alterations and extensions had been made in connection with the works during the past year, and the appliances were now of such a character as to be capable of making gas at the rate of 8,000,000 cubic feet per annum. The usual dividend of 5 per cent. was declared.

The price of gas in Dundee has been reduced from 4s. 2d. to 3s. 11d. per 1000 cubic feet, with 5 per cent. discount on accounts paid within 23 days. This is the third year in succession in which the price of gas in Dundee has been reduced 3d. per 1000 cubic feet; and, allowing for the 5 per cent.



discount for prompt payment of which almost every consumer takes advantage) on 3s. 11d. per cubic feet, the actual price during the ensuing year will only be about 3s. 9½d. The reduced price of coal and the increased value of coke and chemical products largely explain the ability of the Commissioners to reduce the price of gas. Although a larger consumption of gas is calculated upon for the ensuing year, the estimate for coals is only £32,000, as against £33,738 last year. The value of chemical products in 1877-8 was £4514, as compared with £2985 in the previous year. The net revenue account for the past year shows a surplus of £3131. With only one exception—namely, Galashiels—Dundee now enjoys the credit of having the cheapest gas in Scotland.

Tenders for the supply of coal gas to be used during the year ending the 30th of September, 1879, have just been accepted by the Gas Committee on the Town Council of Aberdeen. The quantity of coal contracted for is 22,000 tons, at a total cost of £23,902.

In Dr. Wallace's report on the quality of the gas supplied to the city of Glasgow during the week which ended the 1st of June, it is shown that the minimum illuminating power ranged from 26·28 candles to 27·23 candles, the average from 26·50 candles to 27·55 candles, and the maximum from 26·80 candles to 27·86 candles. The western district, or that supplied from the Partick gas-works, again had the highest results.

At a meeting of the Town Council of Elgin, on Thursday week, it was resolved to give the Gas Company a definite offer for their works and plant, the offer being, it is understood, £17 10s. per share. The Gas Company, however, it is said, will submit to arbitration only.

During the fortnight ending on the 4th inst. the delivery of water into Edinburgh was at the rate of 554470 gallons per minute, equal to 27·28 gallons per head per day to a population of 292,500. On that day the quantity of water stored in the five reservoirs of the Water Trust was 532,178,320 gallons, against 544,925,320 gallons on the 21st ult.; and 694,231,152 gallons on the corresponding date of last year.

The annual meeting of the Shareholders of the Paisley Water Company was held last Thursday—Mr. A. C. Holmes, Governor of the Company, in the chair. The usual dividend of 6½ per cent. per annum, less income-tax, was announced.

It has been resolved by the Nairn Police Commissioners to submit to the Board of Supervision, for their consideration, a drainage and irrigation scheme that has lately been proposed, and to ascertain if the Board are prepared to recommend the Public Works Loan Commissioners to grant a loan of £6000, as also a sum of £3600, to complete and extend the water-works.

The extensive drainage operations that have been in progress during the past four years in the burgh of Johnstone have just been completed at a cost of little under £4000.

On the recommendation of Mr. James Brunlees, C.E., London, the Police Commissioners of Kelso, his native town, are making arrangements to dispose of the town sewage upon a farm by the process of irrigation, and so comply with the provisions of the Rivers Pollution Prevention Act.

Last week's Glasgow pig iron warrant market fluctuated considerably, and a very large amount of business was done, a decided impetus having been given by the encouraging reports received from Middlesbrough. The more hopeful prospect of a peaceful solution of the Eastern Question also had its due effect on the general tone of trade and speculation. At the close of the week a desire to realize induced heavy "bear" operations, and the prices quickly suffered a decline. On Thursday forenoon prices advanced 10d. per ton, as compared with the closing quotations on Friday week; but by the finish of the week's transactions, on Friday afternoon, the advance was reduced to 3d. per ton. There is now more business doing, combined with more willingness to enter into forward contracts. Several makers have advanced their quotations for shipping brands.

The coal market continues to be exceptionally dull.

**HORSHAM WATER SUPPLY.**—The water-works in this town have recently passed into the possession of the Local Board. A meeting of the Shareholders of the Water Company was held on the 30th ult., when it was resolved that the Company be forthwith wound up voluntarily. A donation of £5 each was presented to the Directors, and a year's salary was voted to the Secretary and Manager.

**BURGESS HILL GAS COMPANY.**—The annual meeting was held on the 1st inst.—Mr. W. Wood in the chair. The Directors report showed an available balance of £566 0s. 9d., from which a dividend was declared at the rate of 8 per cent. per annum. After placing 3 per cent. on the gas-rental to the renewal-fund, there remained a balance of £132 13s., which was carried to the current year's account.

**LUTTERWORTH GAS COMPANY.**—The annual meeting was held on the 3rd inst.—Mr. Footman in the chair. The accounts showed that the receipts for gas for the year ending at Lady-day were £788 8s. 2d.; for rent of meters, £43 14s.; for coke, &c., £184 17s. 2d. The Company paid for coal and cartage, £359 19s. 5d. The amount available for dividend was £256 2s. A dividend at the rate of 7½ per cent. was declared, and £56 was carried to the reserve-fund.

**ILKESTON WATER SUPPLY.**—At the monthly meeting of the Ilkeston Local Board, on the 4th inst., the Clerk read a letter from the Public Works Loan Commissioners, stating that they were prepared, as recommended by the Local Government Board, to lend to the Ilkeston Board the sum of £16,000, at 3½ per cent., for the purpose of purchasing the Ilkeston Water-Works, and erecting additional water-works for supplying the district with water. The loan, with interest, is to be repaid by half-yearly instalments, extending over a period of 30 years.

**STOCKTON CORPORATION GAS-WORKS.**—At the meeting of the Stockton Town Council, on the 4th inst.—the Mayor (Mr. Richardson) in the chair—the minutes of the Gas-Works Committee showed an increase in the production of gas during the month of April of 50,300 cubic feet, as compared with the corresponding month of last year. The Chairman of the Gas-Works Committee said there had been an increase in the make of gas of 12 million cubic feet during the past year, which produced a "nice" sum to carry over to the borough fund.

**HULL GAS SUPPLY.**—Mr. James Baynes, jun., reports that the results of his testings of the gas supplied to the east district by the Sutton, Southcoates, and Drypool Gas Company during May were as follows:—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16·01	15·66	15·85
Grains of ammonia per 100 cubic feet	—	—	7·88
Grains of sulphur per 100 cubic feet	—	—	7·90
Mean temperature and barometer in experiment-room:—Temp., 61·30°; Bar. 29·64.			

**WATER SUPPLY OF CAMBRIDGE.**—The following notice from the Authorities of the University has been put in circulation in the town of Cambridge:—

Clare College Lodge, May 22, 1878.

The Lodging-House Syndicate, having had their attention called to the circumstance that much of the well-water in the town is impure and detrimental to health, desire to make it known that they regard it as extremely important that all licensed lodging-

houses should be supplied with water from the Cambridge University and Town Water-Works, and that in fixing the prices of lodgings they will always take account of the nature of the water supply. In future lists of licensed lodging-houses, a distinguishing mark will be affixed to houses supplied with water from the water-works, and all persons whose premises are so supplied are requested to give notice thereof to the Rev. F. G. Howard, the Secretary of the Syndicate, in order that their houses may be correctly designated.

**KIDWORTH GAS COMPANY.**—The annual meeting was held on the 3rd inst.—Mr. Grant in the chair. The Directors reported that the affairs of the Company were in a healthy state. After making a reduction of 4d. per 1000 in the price of gas, and spending £181 in new mains, they had still a balance left to pay the usual dividend. The sale of gas for the year was 2,192,700 feet, which was a decrease upon the previous year of 95,600 feet, owing, no doubt, in a great measure, to the badness of trade. There had not been so large a consumption in some of the large houses. The receipts had been for gas and rent of meters, £637 9s. 8d.; for coke, tar, and lime, £80 1s. 3d.; street-lamps, £38 16s. 6d. The outstanding accounts were £104 7s. 2d., making a total of £1310 15s. The total expenditure for the year had been £988 1s. 3d., leaving a balance of £322 13s. 9d. The Directors recommended a dividend of 6 per cent. free of income-tax, which would take £240, leaving a balance of £82 13s. 9d.

**LIGHTING LAMPS BY ELECTRICITY.**—At the meeting of the Society of Engineers, on Monday, June 3rd, in the Society's Hall, Victoria Street, Westminster—R. P. Spice, Esq., President, in the chair—a paper was read by Mr. St. George Lane Fox, on "The Lighting and Extinction of Gas by Means of Electricity." The author commenced by alluding to what had already been attempted in this direction, with special reference to the pneumatic system proposed some time ago, in which an extra pressure in the gas-mains was made to act upon an apparatus provided for each lamp. He then explained the difficulties that presented themselves, and which led him to design the electric system, which he proceeded to explain, and which has been several times referred to in the JOURNAL. He then proceeded to give an estimate of the cost of applying it, and of the saving that it was expected would result from its use. Taking a district of 3000 lamps, placed 45 yards apart, he estimated the first cost of the system with overhead wires at £4886 15s., and that of the system with underground wires at £7499 5s. The cost of working was placed at 4s. per lamp per annum, for cleaning, lighting, and extinguishing, equal to £600 per annum. The cost of working on the ordinary system, as per estimates supplied by the Gas Companies, was stated to be 18s. per lamp per annum, or equal to £2700. The saving to be effected by the adoption of his system, in working expenses, in gas saved morning and evening by simultaneous lighting and extinction, including interest at 2 per cent., was placed at £3117 9s. 6d. He thus showed that by an outlay of £4886 15s. by the overhead system, or about £7499 5s. by the underground system, an annual saving of £3117 9s. could be effected. By taking the interest upon the outlay at 7 per cent., a net annual saving of £2775 7s. 6d. for the overhead system, or of £2592 10s. for the underground system, would result. With regard to the application of the system in Pall Mall, where 55 lamps were fitted with the apparatus, and placed in the circuit, Mr. Fox explained that, owing to faulty mechanical construction in some of the details of the lamp apparatus, the working had been interrupted. He was having new and more powerful electrical apparatus made, and he expected very shortly to be able to demonstrate the Pall Mall experiment to be a practical success.

**STAFFORDSHIRE POTTERIES WATER-WORKS COMPANY.**—The annual meeting was held at Hanley on the 31st ult.—Mr. J. Alcock in the chair. The Directors in their report announce an increased rental for the year, exceeding that of the previous year by the sum of £1122 8s. 10d. The balance for the year, and the previous undivided balance of £751, make a total of £6165 18s. 3d., out of which the Directors recommend that a dividend be declared at the rate of 6 per cent. per annum (clear of income-tax), which will absorb £5523, and leave a surplus of £642 18s. 3d. to be carried to next year's account. The Directors have purchased the reversion of Miss Clowes's estate at Leek, and have thereby secured the future interest of the Company in this property. The sinking at the Meir extension has been carried to a depth of about 95 yards, and feeders of water met with in larger quantities than the temporary pumping plant was capable of raising. The plant was increased, and is raising about 800,000 gallons per day from the bore-hole, but up to the present the water has not been lowered to any extent. The Meir pumping-station during the past year has undergone considerable repairs. Two new working barrels and valves of improved construction are now lying at the works ready to replace those at present in use, and which have become defective. The Wall Grange engines have undergone some small repairs, and these, together with the reservoirs and other works, are in good working order. The service and distribution of water to the district continue to receive special attention. The detection and prevention of waste by systematic inspection has enabled the Company to give an improved service over the greater portion of the district. The Chairman, in moving the adoption of the report, stated that the collection of the water-rates had been attended with a loss of 1s. 9d. per cent. in the past year, and in the previous year of only 1s. 3d. per cent., which, he thought, was highly creditable both to the consumers and the collectors, especially when they considered the depression of trade which had prevailed. Mr. Tellwright seconded the motion, and said it was clear that the business of the Company was in very excellent hands. The report was unanimously adopted, and the Chairman proposed a dividend of 6 per cent., which was seconded by Mr. Walker, who congratulated the Shareholders on the magnificent property they possessed, and said the Directors managed it as energetically and carefully as if it were their own private business. The resolution was carried. Mr. John Strick was re-elected auditor, and Mr. Narramore, the continuing Auditor, was thanked for his services. Messrs. C. Keeling, R. Heath, M.P., J. Edge, and B. Boothroyd were re-elected Directors. A vote of thanks was given to the Chairman and Directors for their services.

## Register of New Patents.

### APPLICATIONS FOR LETTERS PATENT.

- 2180.—SWEET, A., Hampstead Road, London, "Improvements in cooking and heating by gas." May 31, 1878.  
 2208.—DANIEL, J. A., Halifax, Yorks, "Improvements in taps and valves, and in the manner and apparatus for connecting the same." June 1, 1878.  
 2228.—TYLOR, J. J. and W. A., Newgate Street, London, "Improvements in the arrangements and fittings of water-closets, lavatories, urinals, and other sanitary apparatus, and the parts used in connection therewith, for controlling, regulating, and arresting the flow of liquids and fluids to or from the same, whereby more convenience in use is effected, waste prevented, and greater sanitary advantages obtained." June 4, 1878.  
 2231.—HEATON, C. W., Lessness Heath, Kent, "Improvements in purifying gas, and in apparatus employed therein." June 4, 1878.  
 2233.—NEWTON, W. E., Chancery Lane, London, "Improved apparatus for exhausting or impelling liquid or gaseous bodies." A communication. June 4, 1878.



## PATENTS WHICH HAVE PASSED THE GREAT SEAL.

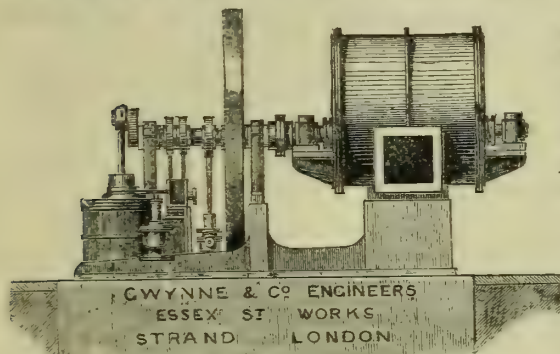
4637.—BOND, F. T., Gloucester, "Improvements in filters." Dec. 7, 1877.  
 4703.—ROMMEL, A., Moorgate Street Buildings, London, "Improvements in oscillating pumps." A communication. Dec. 11, 1877.  
 4813.—DUNN, R., Wylam-on-Tyne, Northumberland, "Improvements in raising water or other liquids, and in the apparatus employed therein, parts of which improvements are also applicable to other similar purposes." Dec. 18, 1877.  
 493.—SIMON, L. and R., Nottingham, "Improvements in and connected with gas-engines." Feb. 1, 1878.

## PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.  
 1857.—TYLOR, A., "Improvements in apparatus and arrangements for controlling, arresting, measuring, and recording the flow of liquids and fluids, and preventing the escape and waste of the same." May 20, 1875.  
 1865.—MORGAN-BROWN, W., "Improvements in photometers." May 21, 1875.  
 1948.—COPP, W. L., and WHITE, C., "Improvements in apparatus for the manufacture of gas." May 27, 1875.

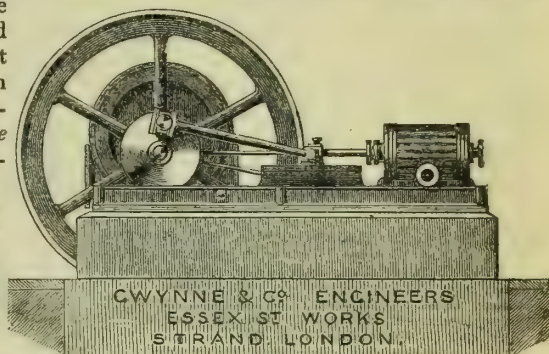
The GRAND MEDAL OF MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS;  
 Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

## GWYNNE &amp; BEALE'S PATENT GAS-EXHAUSTERS &amp; ENGINES.



The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

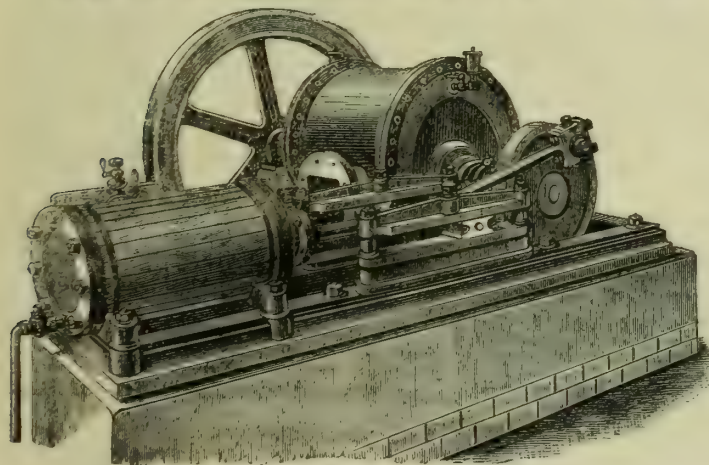
## BEALE'S IMPROVED PATENT GAS EXHAUSTERS

WITH

Wrought-Iron Spindles and  
ENGINES COMBINED.

SOLE MAKERS,

GEORGE WALLER & CO.



MAKERS OF ENGINES, EXHAUSTERS,  
INDEX AND DISC GAS-VALVES,  
HYDRAULIC MAIN VALVES,  
BYE-PASS VALVES,  
TAR, LIQUOR, AND OTHER PUMPS,  
SCRUBBERS AND PURIFIERS,  
CONDENSERS, BOILERS, &c.

Awarded Silver Medal at the Manchester Exhibition of the Society for the Promotion of Scientific Industry.

Phoenix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

## TO GAS ENGINEERS.

## D. BRUCE PEEBLES &amp; CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

TAY WORKS. BONNINGTON, EDINBURGH.

## WANTED, by a Gentleman, aged 29, a

Situation as MANAGER of a Gas-Works on the Continent or abroad. Advertiser has been about seven years in present situation as Engineer and Manager, where the make of gas is about 150 million cubic feet.

Thoroughly understands the erection of works, also the manufacture and distribution of gas in all its branches. Speaks French and Italian. Can leave present situation immediately. Excellent testimonials.

Address C. E., care of Messrs. Dawson and Sons, Cannon Street, LONDON.

## WANTED, Readers of the Pamphlet,

"Cooking and Heating by Gas; on Burners," &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Gas-Works, STEDENHAM, S.E.

## WANTED, by Samuel Thompson &amp; Co.,

Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

## WANTED, Orders for Samples to test

the superior Silkstone, Wigan, and other Gas Coals and Cannel on Sale by G. J. EYSON, Gas Coal and Cannel Contractor, BIRMINGHAM.

N.B.—Prices on personal application, or by post or telegram, on shortest notice, and prompt delivery.

## THE MALTA &amp; MEDITERRANEAN

GAS COMPANY, LIMITED.

NOTICE is hereby given that the ORDINARY GENERAL MEETING of the SHAREHOLDERS of this Company will be held at the Offices, 60, Gracechurch Street, London, E.C., on TUESDAY, the 25th of June, at Twelve o'clock at noon, for the purpose of receiving the Report of the Directors and the Accounts for the year ending the 31st of March, 1878; and the transaction of the general business of the Company.

One of the Directors, Mr. J. B. Paddon, will retire from office, but is eligible for re-election.

The Transfer Books will be closed from the 18th inst. until after the Meeting.

By order of the Board,  
F. A. DUFFIELD, Secretary, pro tem.  
60, Gracechurch Street, June 4, 1878.



**A Young Man, aged 22, who has just** finished a four years engagement with a provincial Gas Company is open to take a situation as Manager of small Gas-Works, or as Assistant to the Engineer of large Works. Can give first-class testimonials. Has no objection to go abroad.

Address No. 460, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, by a Young Man, aged 22,** who has had five years experience in a Provincial Works (make, 75 millions), a SITUATION in a Gas-Works. Can use Photometer, fair Draughtsman, good Writer, quick at figures, and thoroughly understands general routine. Apply S. I. C. E., 54, Hareless Street, RAMSGATE.

**WANTED, a re-engagement as Work-**ing MANAGER of Small Gas-Works. Has a practical knowledge of Retort Setting, Main, Service, and Meter Fixing, and Indoor Fittings. Could enter on his duties immediately. Unexceptionable reference. Address T. S., care of Mr. R. Shadbolt, Gas-Works, FLEETWOOD.

TO GAS ENGINEERS, CONTRACTORS, &c.  
**WANTED, by the Advertiser, a** situation as DRAUGHTSMAN or ASSISTANT ENGINEER. Has had 25 years practical experience in the erection, &c., of Gas-Works. Good references. Address No. 464, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED immediately, by a Gas** Company in South Wales, a respectable young man as RENTAL-CLERK. Applicant must possess a thorough knowledge of the routine of a Gas Office. Address, in own handwriting, stating age, salary required, with copies of testimonials, No. 465, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

#### BIRSTALL LOCAL BOARD.

##### METER INSPECTOR.

**THE Birstall Local Board require a Meter** INSPECTOR and REPAIRER immediately. The person appointed will have to assist in Laying Mains and Services. A plumber preferred.

Applications, in writing, stating wages required, accompanied by testimonials of a recent date, to be sent to me, sealed, and endorsed "Meter Inspector," not later than Friday next.

JNO. SMITH, Solicitor, Birstall, near Leeds,

Clerk to the Board.

Birstall, near Leeds, June 8, 1878.

**TWO Purifiers, 6 ft by 4 ft, 6-in. Valves** and Connections, with Lifting Apparatus and Girders complete; also a Set of Twelve Pipe Condensers, all in working order, to be SOLD, a bargain. Apply to Manager, Gas-Works, ENFIELD.

**ON SALE—A Station-Meter (with new** Drum), capable of passing 10,000 cubic feet per hour, with Hydraulic Valves, Bye-Pass, &c.; 10-in. Connections. Has been removed to make room for one of larger capacity. For particulars and price, apply to GEORGE NEWTON, Gas-Meter Manufacturer, Union Street West, OLDRAM.

**ON SALE—One Station-Meter, to pass** 1000 cubic feet per hour. Almost new. Will be sold cheap. Apply to J. HALL, Gas-Works, St. Helen's, LANCs.

#### RIPON CORPORATION GAS-WORKS.

**EXHAUSTER for Sale (by Dempster),** with Engine, Bye-pass Valve, and Governor complete, capable of passing 3000 cubic feet per hour. Has been five years at work, and is in good repair, being sold to make room for a larger one. Apply to GEO. IRVINE, Gas-Works, RIPON.

#### TO GAS COMPANIES AND OTHERS.

**THE East Retford Gas Company, Limited,** have on SALE the following:—  
One 4-Horse Vertical Steam-Engine, high pressure, 6-in. Cylinder, 12-in. Stroke, 4-ft. Fly-Wheel, Pump, Governors, and Stone Bed.

One 8-Horse Vertical Steam-Engine, high pressure, 8-in. Cylinder, 16-in. Stroke, 6-ft. Fly-Wheel, Pump, Governors, and Stone Bed. Has only been in work Four years, and is in first-rate condition.

The above can be inspected at the Gas-Works. Have been removed to make room for one of larger size. Offers to be made to F. BAILEY, Manager.

**FOR SALE—Two Purifiers, measuring** 8 ft. by 8 ft. and 4 in. deep, with Lifting Apparatus. They are in excellent condition, and have been put out of use by larger ones. Apply to Mr. OATLEY, Gas-Works, New Southgate, MIDDLESEX.

**TO BE SOLD—The Watlington Gas-**Works, Oxon. Apply to J. W. DAVIS, George Street, HULL.

**GAS-WORKS TO LET.—The Directors** of the Yatton Gas Company, Limited, are desirous of receiving TENDERS for taking the YATTON GAS-WORKS for a term of Seven or Ten years.

Form of lease can be seen on application to the Chairman, Mr. W. H. SAY, Yatton, from whom, or from the Secretary, Mr. SAMUEL DAWES, Clevedon, all further particulars can be obtained.

Approved security to the amount of £500 for the due fulfilment of terms of lease will be required.

Tenders to be sent to the Chairman on or before Saturday, the 22nd inst.

The Directors will not necessarily accept the highest or any tender.

**THE Nantwich Gas Company, Limited,** are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works from the 1st of July.

Tenders to be sent to the Manager on or before the 15th of June.

Gas-Works, Nantwich, Cheshire, May 25, 1878.

**THE Directors of the Yeadon and** Guiseley Gas Company invite TENDERS for the Supply of about 2800 Tons of GAS COAL, and 200 Tons of CANNEL COAL, both kinds to be well screened, and free from bats, pyrites, and dirt, to be delivered at Guiseley Station, or at the Gas-Works in Yeadon, in such quantities, and at such times, as may be required during the Twelve months ending June 30, 1879.

The right to order all or any part is reserved. Sealed tenders are to be sent to me, the undersigned, on or before Tuesday, the 18th inst., endorsed, "Tender for Gas Coal."

The Directors do not bind themselves to accept the lowest or any tender.

By order,  
EDWARD LISTER, Manager and Secretary.  
Gas Office, Yeadon, June 6, 1878.

**THE Directors of the Surrey Consumers** Gas Company are desirous of receiving TENDERS for the surplus TAR and the whole of the AMMONIACAL LIQUOR produced at their Works for Twelve months, from the 1st of July next. The Tar and Liquor will be delivered free into barges at the Company's wharf, and is to be paid for monthly.

Further information can be obtained on application at the Company's Offices, Rotherhithe Street, where the tenders are to be sent in, on or before Thursday, the 20th of June.

The Directors do not bind themselves to accept the highest or any tender.

W. P. BODDY, Secretary.  
Rotherhithe, June 11, 1878.

#### TENDERS FOR GAS COAL.

**THE Directors of the Oakengates and** St. George's Gas Company invite TENDERS for the Supply of 1200 Tons of Well-Screened GAS COAL, as free as possible from sulphur, bats, bind, refuse, and dirt, to be delivered free at the Great Western Railway Station, Oakengates, in such quantities as may be required, between Aug. 1, 1878, and Aug. 1, 1879.

Tenders (of which the Directors do not bind themselves to accept the lowest or any) must be sent to the undersigned not later than July 1.

GEORGE PARKER, Manager.  
Oakengates, Salop, June 8, 1878.

#### GAS TAR AND AMMONIACAL LIQUOR.

**WANTED, Tenders for the above pro-**ducts, or either of them, for One or more years, from the 1st of July next. Quantity, about 10,000 Gallons of each per annum.

Tenders to be sent on or before the 21st of June to the undersigned, who will give any further information.

JOHN PATTINSON.  
Gas-Works, Cockermouth.

#### LEIGH GAS-WORKS.

**THE Gas Committee of the Leigh Local** Board invite TENDERS for Supplying, Fitting, and Affixing the IRONWORK for Retort and Purifying House Roofs, the particulars of which may be obtained from the Engineer.

Sealed tenders to be addressed to the Chairman, marked "Tender for Ironwork of Roofs," and delivered on or before the 18th inst.

The Committee do not bind themselves to accept the lowest or any tender.

JOSEPH TIMMINS, Engineer, &c.  
Leigh, Lancs.

#### TO IRONFOUNDERS.

**THE Gas Committee of the Buxton Local** Board invite TENDERS for the Supply of about 1680 Yards of 12-in. Turned and Bored Cast-Iron PIPES. Specification and forms of tender to be had of Mr. G. Smedley, Gas-Works, Buxton.

Tenders, endorsed "Gas-Pipes," addressed to the Chairman, must be sent in on or before Monday, the 24th inst.

JOSIAH TAYLOR, Clerk to the Board.  
Buxton, June 6, 1878.

#### TAR AND AMMONIACAL WATER.

**TO BE DISPOSED OF, the Tar and** AMMONIACAL WATER produced at the Merthyr Tydfil Gas-Works.

The Directors of the Company will be glad to receive offers to purchase the same for a period of Three or Five years.

Particulars as to quantity, &c., may be obtained of the undersigned.

The right to accept or refuse the highest or any offer is reserved.

By order,  
J. L. COCKER, Secretary and Manager.  
Gas Office, Merthyr Tydfil, Glamorganshire,  
May 20, 1878.

#### TAR AND AMMONIACAL LIQUOR.

**THE Directors of the Accrington Gas** and Water Works Company invite TENDERS for the TAR and AMMONIACAL LIQUOR produced at their Accrington Works for One, Two, or Three years, from July 1 next. Quantity of coals carbonized about 8500 Tons.

Any further information can be had on application to the undersigned.

Tenders, endorsed "Tender for Tar and Liquor," to be sent in not later than Thursday, the 13th inst., addressed to the Chairman, Gas and Water Works Company, Accrington.

CHARLES HARRISON, Secretary.  
Offices of the Company, Accrington, June 1, 1878.

#### MACCLESFIELD CORPORATION GAS-WORKS.

##### CANNEL AND COAL CONTRACTS.

**THE Gas Committee are prepared to** receive TENDERS for the Supply of the whole, or part of, 4000 Tons of CANNEL, and 6000 Tons of GAS COAL; the deliveries to extend to Two years, from the 1st of August ensuing, free at Macclesfield, and in such quantities as may be ordered by the Manager.

Tenders, specifying the description of Cannel or Coal, the pits at which they are to be raised, and the terms for net monthly payments, to be sent in not later than June 22, addressed to the Chairman, Gas Committee, Town Hall, Macclesfield.

The Committee do not bind themselves to accept the lowest or any tender.

THOMAS MOORE, Manager.  
May 27, 1878.

#### ROCHDALE CORPORATION.

##### TENDERS FOR PIPES.

**THE Gas Committee of the Corporation** invite TENDERS for the Supply of 200 Yards of 20-in. Cast-Iron GAS-PIPES, with Turned and Bored Joints, to be coated with Dr. Smith's process, and delivered free at Rochdale Railway Station.

Particulars as to weights, &c., may be obtained from the Engineer, Mr. Paterson, Gas-Works.

Tenders, endorsed "Cast-Iron Pipes," to be sent to me on or before the 18th of June inst.

By order,  
ZACH. MELLOR, Town Clerk.  
Town Hall, Rochdale, June 7, 1878.

#### ROCHDALE CORPORATION.

##### TENDERS FOR STATION-METER.

**THE Gas Committee of the Corporation** invite TENDERS for the Supply and Erection at their Works of a STATION-METER to pass 60,000 feet of gas per hour. Connections to be 18 inches, and the Valves and Bye-Pass to be Hydraulic. Tenders must be accompanied by a specification and tracings of the front and back elevations of the meter.

Mr. Paterson, the Engineer at the Gas-Works, will give all other information required.

Tenders, endorsed "Station-Meter," must be sent to me on or before the 15th of June inst.

By order,  
ZACH. MELLOR, Town Clerk.  
Town Hall, Rochdale, June 7, 1878.

#### OVER DARWEN LOCAL BOARD.

##### TO GAS ENGINEERS AND IRONFOUNDERS.

**THE above Board invite Tenders for** alterations to an existing SCRUBBER; also for one new Cast-Iron SCRUBBER, 50 ft. by 10 ft., with 16-inch Valves and Connections for both.

Particulars can be obtained, and plans and specifications seen, on application to the undersigned.

Tenders, endorsed "Tender for Scrubbers," to be addressed to C. Coster, Esq., Law Clerk, Darwen, on or before the 1st of July next.

THOS. DUXBURY, Manager.  
June 4, 1878.

#### BURTON-ON-TRENT GAS-WORKS.

##### CONTRACTS FOR IRON ROOFING, RETORT FITTINGS, PURIFIERS, AND OTHER APPARATUS.

**THE Commissioners for Executing the** Town of Burton-upon-Trent Act, 1853, are prepared to receive TENDERS for the Construction and Erection of certain Wrought-Iron ROOFING, required for the Extension of their Gas-Works at Burton-on-Trent, comprising Roofs of 52, 35, and 30 ft. spans or thereabouts; also for the Gas-Making and Purifying Apparatus, comprising 56 Retort Mouthpieces, and the Furnace Fittings and Ascension-Pipes connected therewith; two Hydraulic Mains; and other materials and apparatus.

Drawings may be seen, and specification and form of tender may be had, on application at the Office of Mr. Mudie, the Manager of the Commissioners Gas-Works, Burton-on-Trent, on and after Wednesday, the 29th day of May inst., and at the Office of Messrs. Thomas and Charles Hawksley, Civil Engineers, 30, Great George Street, Westminster, S.W., and tenders must be delivered to me at the Offices of the Commissioners, on or before 10 o'clock a.m. of Wednesday, the 12th day of June next.

The Commissioners do not pledge themselves to accept the lowest or any other tender.

By order,  
T. N. WHITEHEAD, Clerk to the Commissioners.  
Burton-on-Trent, May 18, 1878.

#### RADCLIFFE AND PILKINGTON GAS COMPANY.

##### TAR AND AMMONIACAL LIQUOR CONTRACT.

**THE Directors of the above Company are** prepared to receive TENDERS for the Purchase of the TAR and AMMONIACAL LIQUOR made at their Works, Egerton Street, Sion Street, Radcliffe, for a period of One or Two years, commencing from the 1st day of August next.

Tenders must state the price which will be given per Ton for Tar or Ammoniacal Liquor, separately or together; the purchaser to provide barrels and cartage from the Works, and the Company to fill them on the Works.

The purchase to be paid for monthly.

Tenders to be sent to the Manager and Secretary not later than Thursday, July 4, 1878.

By order,  
JOHN BRANDWOOD, Manager and Secretary.  
Sion Street, Radcliffe, May 24, 1878.

#### MANCHESTER CORPORATION GAS-WORKS.

##### AMMONIACAL LIQUOR.

**THE Gas Committee of the Corporation** of Manchester are prepared to receive TENDERS for the Purchase of the AMMONIACAL LIQUOR to be produced at their Gaythorn and Rochdale Road Works during a period of One or more years, commencing from the 1st day of January, 1880.

In addition to tenders for the purchase of the Liquor in its crude state, the Committee will also be prepared to consider TENDERS for its DISPOSAL, either by manufacture into Sulphate of Ammonia at the above-mentioned Works on their behalf, or in any other manner.

The Committee reserve to themselves the option of accepting the offer, the terms of which they may deem most advantageous.

They do not bind themselves to accept the highest or any tender.

Sealed tenders, addressed to the Chairman of the Gas Committee, Town Hall, and endorsed "Tender for Ammoniacal Liquor," must be delivered at these Offices, on or before Thursday, the 1st day of August next.

Forms of tender and further particulars can be obtained on application to Mr. George B. Jackson, at the Gas Offices.

By order of the Gas Committee,  
JOSEPH HERON, Town Clerk.  
Town Hall, Manchester, May 31, 1878.



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THE JOURNAL OF GAS LIGHTING,  
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 18, 1878.

Circular to Gas Companies.

WE wrote last week upon the advantage of Gas Exhibitions, and in view of the contemplated visit of the Gas Managers to the Paris Exposition Universelle, we must, however unnecessarily, call the attention of our readers to the Pavilion in which the Compagnie Parisienne du Gaz have brought together a most perfect collection of everything illustrating the manufacture and distribution of coal gas. It may not be quite correct to say everything; for, of course, they cannot show, in actual operation, in an exhibition of this kind, the Siemens furnace, which is largely used by the Paris Company, but which has not, for reasons we do not understand, obtained employment in this country. An exhibition such as is to be seen now in Paris would not be possible in this Metropolis, except under similar conditions; and for these, we fear, we shall have to wait for many years. English manufacturers are rather tired of these great International Shows. They cannot be said to pay; thus the interest in them flags. Nevertheless, we still hope to see a grand exhibition of gas apparatus in London; but, before such a display as that to be now seen in Paris can be brought together here, there must, as in the French capital, be but one Company.

Could the Directors of the London Companies who have visited Paris have had sufficient time to give a full and fair consideration to the circumstances of the Paris Company, they must have left the French Metropolis with a strong conviction of the advantages of unity of management, or, say, of amalgamation. The ten manufacturing stations of the Company are all governed by the same Board, and a study of the accounts will reveal the economy which results from a concentration of management. More than this, we believe that the working details of each separate establishment will illustrate the good effect of supervision by one head. The Managers of the various stations are a superior class of men, and, under the direction of one of the ablest Engineers in

France, they must necessarily work to greater advantage than they would if each one carried out his own ideas. Still the Managers are not at all fettered in their efforts to introduce improvements which may suggest themselves to their minds, and we owe to some of them many advances in our manufacture; but all is done under the control of a General Board, among whom may be found some men of great eminence in the scientific world. The advantage of having one body to carry out the business details will be apparent to every one. If we look at coal contracts alone, it is certain that a great saving must result from purchasing the raw material for all the stations at the same time. As the Paris Company work up their own residuals, we cannot say what would be the consequences if they made a single contract for the disposal of all these separately. One great advantage which will presently result from the amalgamations that have been carried out in this Metropolis will, we expect, be a large profit from the working up of residuals. Supposing all the Metropolitan Companies united, a much larger field for manufacturing operations of this kind would be opened up, which, if well cultivated, must end in a large increase of profit to the united Company.

With our complicated municipal arrangements, it would be difficult, under any circumstances, to introduce the plan which puts the Municipality of Paris and the Gas Company in perfect accord—namely, the equal division of profits over ten per cent. We can easily imagine the delight which would be felt in Spring Gardens at the prospect of sharing in the profits of our Companies. The sliding scale would never have been dreamed of, and the standard price might have been anything. It would be premature, however, to speculate upon contingencies which may never arise, and we shall not now attempt to indicate a course of policy which, while leaving the one Gas Company in possession of their property, would, at the same time, satisfy the wishes of our Local Authorities. They long for gas profits, and it may be possible to afford them the luxury without confiscation. Of Paris, the Gas Exhibition, and the arrangements of the Compagnie Parisienne du Gaz we shall presently have more to say; for the moment, we leave it with the suggestion that all Metropolitan Directors who visit Paris should study the admirable system pursued in that city, in which case we are certain they will come home fully convinced of the benefits of amalgamation.

The annual report of the Metropolitan Board of Works for 1877, which has just been issued, details very fairly the condition under which the London Gas Companies, who have been brought under modern legislation, now pursue their business; but the Board have not the grace to acknowledge that, as regards illuminating power and purity, the Companies faithfully fulfil their obligations. The report observes that the sliding scale is working advantageously, both for the Companies and the public. It may be so, but we are by no means certain that the public might not have been better served without the sliding scale. Of the effect of auction clauses we cannot at present say anything. It will be some years before they are brought into operation, and the consequences of them will hardly be felt in the present generation. Future consumers may possibly realize some benefits from their adoption, but it is impossible to foresee what may be the circumstances of gas industry twenty or thirty years hence.

The testing of gas-meters continues to be profitable to the Board, but the profits do not now pay the expenses of the Examiners who report upon illuminating power, &c. It is right to say, however, that heavier costs fall upon the Gas Companies than upon the Metropolitan Board. The Chief Gas Examiner, the Referees, and the Auditor constitute a charge which is really an onerous burden upon them. By rights, the public should pay this charge, for it is incurred for their protection, and it is against all precedent in English jurisprudence that Companies should be fined for this kind of supervision. It is said that when a man is bastinadoed in Turkey he pays the beater, and also the man who counts the strokes. Gas Companies are mulcted much the same way in this country.

The Brighton Board of Guardians have resolved upon making their own gas for the supply of the Industrial Schools. It seems that, in order to be supplied by the Black Rock Company, it would have been necessary to lay a main a mile long from the workhouse to the schools, which would have cost £756 5s., and, together with the fittings, would have involved an estimated expenditure of £996. The Committee calculated, however, that the cost of buildings, works, and fittings for the supply of 200 lights, would only amount to £1044, and they imagine that they can make gas for 2s. 3d. or 2s. 6d. per thousand, and have some residuals left for profitable utilization; so they have determined to supply themselves from their own works. We are not without fear that some mistakes have been made in the calculations of the Committee. After a year or two's trial of their system, they may possibly come to the con-



clusion that it would have been cheaper in the end to obtain a supply from the Old Brighton Company. In the meantime, their estimates will have been overhauled by the Local Government Board; for, before they can start gas-works, they must borrow money.

The Birmingham Exhibition of Gas Apparatus had a somewhat triumphant conclusion. It was considered so successful that it was continued open for two additional days, in the course of which numbers of the artizan class availed themselves of the opportunity of witnessing the display. It was natural that these should be most attracted by the cooking apparatuses, which received the greatest share of their attention. We hope that the cooking lessons on these occasions were better adapted to the wants of working men and women than were those which were taught us, much as we appreciated them. It was somewhat amusing to hear a lady who had spent, perhaps, ten minutes or a quarter of an hour over the concoction of a little sauce, announce to her hearers that cooking by gas was not the least trouble. The statement, however, was perfectly true; cooking is one thing, but mixing sauces another. The artizan and his wife are content to do without such delicate additions to dishes; and it should have been made plain to them that such cooking as they required could really be done, as the lady said, without the least trouble. Some artizans have seized the fact; but a difficulty has arisen, and a very natural one—the first cost of the apparatus. We have several times recommended English Gas Companies to follow the example of their Parisian contemporary, and let out apparatuses on hire. Corporations, in these days, affect to be paternal, and they may just as well follow up the principle. Cooking-stoves and other apparatus, lent like meters, would be a great boon to the consumers, and would bring some profit to the suppliers of gas. There is another side also to the question, which, we notice, has not been overlooked—that is, the pressure at which gas must be supplied during the day, if cooking-stoves were generally adopted. There is a fear among gas officials that great loss from leakage would result if a high pressure were maintained during the daylight hours; but we do not think that much anxiety need be felt on this ground, if mains be properly laid, and effective district governors be established.

The Stafford Gas Company have wound up their affairs, but a small hitch occurred in the final proceedings. The amount of purchase-money to be paid by the Corporation is £70,000, and of this the Directors proposed to divide £68,400, or twenty-eight and a half years purchase of dividends, *pro rata* among the Shareholders, leaving £1600 to be appropriated as the Shareholders might think fit. It was, of course, expected it would be voted to the Directors and the Manager, but the Proprietors did not seem to see it, and, in the end, it was decided to divide the whole amount of £70,000, and privately raise a testimonial to the Directors and Manager. We cannot say that this is grateful conduct on the part of the Shareholders, for the Board have worked well in their interest, and have received but scanty remuneration. For years, some of those who were in office when the Company were transferred received no *solatium* at all, and of late years, when the Company became prosperous, obtained but small pecuniary recognition of their services.

Small matters sometimes involve great principles. The diminutive Local Board of Whittington have been for more than a year negotiating for the purchase of the gas undertaking within their limits. Now, however, when they might obtain them, they decline to purchase, on the sensible grounds that the times are depressed, and the borrowing powers of the Board limited. It is gratifying to see even a small Local Board hesitating to run into debt.

Another application has been made to the Recorder of Liverpool to appoint an official Auditor, under the Gas-Works Clauses Act, 1847, to go through the accounts of the United Gas Company for the past year. We can hardly imagine any necessity for this proceeding, but we are certain that the Company have no objection to any number of official Auditors going through their accounts. It is a small piece of paltry spite on the part of one or two members of the Town Council, who will doubtless be chagrined when the Auditor reports that he finds the accounts perfectly correct.

Some accident must have happened at the gas-works at Weymouth, for terrible complaints were made last week of a stench which pervaded part of the town, and which was evidently sulphuretted hydrogen emanating from the gas-works. We believe the Weymouth Company manufacture sulphate of ammonia on the works, and probably some disarrangement of the apparatus allowed the escape of the gas which excited so many complaints. It has been said so many times in these columns that the statement hardly needs repetition, that the transference of liquor from

one part of the works to another, and the manufacture of sulphate of ammonia, need not occasion disgust to the most delicate nose.

Under the superintendence of Mr. E. J. Reed, C.B., some improvement has been made in the electric light. But the Moderator Electric Lamp still lacks all the elements which would be calculated to fit it for the illumination of small areas. Gas still holds its own for lighting shops and dwelling-houses, and we venture to predict that for many years to come nothing will be discovered to supersede it. In the meantime, our contemporaries report that the lighting of the Boulevard des Capucines and the Rue de l'Opéra continues to be highly successful. Our readers, when they pay a visit presently to Paris, should give a careful inspection to this display, remembering our dictum, that while the electric light is eminently adapted for the illumination of public spaces, it cannot for a moment invade the strongholds of Gas Companies.

### Water and Sanitary Notes.

WHY there should be any mystery about treating sewage with a little lime, collecting the sludge, drying it, and then burning it in a kiln, we cannot imagine; but when we write to a friend at Burnley for information, which we know is never given at meetings where bottles of sewage and effluent water are exhibited and a luncheon follows, we are told that "the gates of the 'sewage-works are guarded most carefully against intruders.'" Why, if cement of such strength as good Portland and Roman cement can be made at Burnley, ought there to be any secrecy about the matter? According to the report we find in the *Journal of the Society of Arts*, the compost finds a ready sale, and is of excellent quality. If such be the case, General Scott's success may be considered certain, although the price of cement, as made in the ordinary way, must be greatly reduced. We cannot, however, yet recommend the system to Local Authorities, much having to be established before the cement can be deemed a commercial commodity. When the mixture of lime and sewage overflows at Birmingham, it will do very well to stick the blades of Lord Norton's grass together, but we must have strong testimonials from architects who have been engaged in other than Government buildings, before we can regard sewage cement as an article worthy the attention of builders and contractors.

The Southwark and Vauxhall Water Company, we are happy to say, are progressing. For the past half year they will pay a dividend of three per cent., in place of the two and a half paid in the previous half year. We have before said that the district of the Company has been greatly under-rated, but the additions made in parts of the district have excited a hostile spirit. We are glad, then, to learn that in future the Directors will give due notice of any increase in the rating. This, while it cannot affect the legal rights of the Company, will be satisfactory to consumers, and will, no doubt, allay the irritation which now prevails. The prospects of the Company are excellent, and nothing but very bad management can stand in the way of a revival, which will in a short time bring the finances of the Company back to the position they held a year or two ago. We strongly advise Shareholders to retain their interest in the Company, and not part with property the value of which at no long date will be doubled.

It is certain that any attempt on the part of the Water Committee of the Town Council of Liverpool to obtain water from any of the affluents of the Severn will be stoutly opposed, both by the River Authorities and the towns and cities which lie on the banks. On the one hand, it is contended that to abstract water from the upper part of the river would spoil the salmon-breeding grounds, and, on the other hand, towns like Worcester, which contribute a large amount of sewage to the river, are naturally anxious to have a large bulk of water to dilute their filth. Worcester, it may be, to-day, may not look with much interest on the salmon-breeding grounds, for years ago local legislation interfered to protect the apprentices of the city from being compelled to eat salmon more than three times a week. There are other schemes before the Corporation of Liverpool which will not excite the opposition that will certainly be brought against the Vernieu source. They may be a little more expensive, but with water of equally good quality it little matters whence it comes, and at what cost it is brought.

The Prince of Wales's residence at Sandringham has received an effective supply of pure water at the hands of Mr. R. Rawlinson, C.B. The source is a well in the chalk, from which the water issues with a hardness of seventeen degrees; but, by Clark's process, this is reduced to about six degrees. It is raised to a tank which is situated considerably above the highest part of the house; so that, by the use of hydrants, which are freely



distributed, the premises are securely protected from destruction by fire. The village of West Newton is supplied from the same source. It is hardly necessary to add that the works have been carried out under the superintendence of Messrs. Lawson and Mansergh.

The new colliery district in the neighbourhood of Nottingham is in want of water, and will presently require a good deal of that element. The Hucknall Torkard Local Board proposed to supply this want, and, in order to do so, applied for a Provisional Order, which, if granted, would have given them power to sink a well in close proximity to one belonging to the Nottingham Water Company. The Order, however, which was opposed in Parliament, was not granted, and the Hucknall Board may now, as they were originally offered, take a supply in bulk from the Nottingham Company. It was offered at the ridiculously low rate of twopence per thousand gallons; but now that the Board have been defeated, we imagine higher terms will be demanded, and thus there will be another illustration afforded of the short-sighted policy of Local Authorities.

The action taken by Earl Redesdale has placed the Bill of the Durham Water Company in great peril; but some difficulties lie in the way of the opposing party. The requirements of the Borough Funds Act are very stringent, and tend, as they were meant to do, to cause delay. There is one hope, however, for the opponents of the measure—Lord Redesdale may exert his influence to secure its rejection on the third reading. It may be that this result would be beneficial to the Water Company themselves, who, before next session, might be able to select a source of supply preferable to the River Wear. It cannot be denied that this stream is enormously polluted above the intake of the Company, and it would really seem desirable that the inhabitants of Durham should be supplied from a purer source. The fact remains, however, as we stated last week, that Durham is a fairly healthy city, which is one more proof that there is very little connection between the condition of a water supply and the health of a population.

Truth to say, we are very much afraid that the letter of H.R.H. the Prince of Wales, which has been followed by a flood of talk in the Adelphi, and no little correspondence in the *Journal of the Society of Arts*, will, in the end, produce but little result. The question is a highly complicated one, and cannot be settled by a conference lasting two days, and correspondence extending over two weeks. Years must pass, and many social changes must take place, before the community become perfectly alive to their wants, and experience shows how these can be best supplied. It is no new thing in this JOURNAL to assert that the first requirement, when the water supply of the whole country is considered, must be a hydrological survey, which will assign to each district a water-bearing area capable of supplying its wants without interfering with the necessities of its neighbours. We do not require a permanent Royal Commission. Existing Ordnance Maps will supply us pretty fully with all the information it is desirable to obtain, and a few gentlemen well skilled in the science of hydrology could in a short time arrange the materials for the use of Local Authorities. But then comes the difficult question—the water being found, how is it to be brought home to the village populations who require it. We put towns which are capable of taking care of themselves out of the question. All the water agitators of the day are concentrating their attention on the water supply of sparsely populated rural districts, commonly furnished with impure water from shallow wells, and sometimes utterly destitute of any water at all. To supply these would tax the energies of any Local Authority, and produce such a drain on the pockets of responsible ratepayers as could not be borne. There is, in fact, nothing to be done in most cases but to go on as we are going, and leave time, which heals all, to cure the difficulty. That there is a quantity of water procurable in this country, sufficient for more than four times the present population, is beyond doubt, and all that we can say is, that when the population is four times what it is now, the supply of water will probably be much more easy and less costly. Every village, or we may then call it a town, may have its reservoir and conduits. We may no longer witness the sight of two villages fighting for possession of a brook, which takes across a road a dribble of dirty water; nor find a hamlet of considerable size supplied by barrels on wheels, at the rate of one halfpenny a pailful. It must not be supposed we jest on a subject of the utmost importance to small communities; we merely wish to enforce an assertion often made here, that matters of this kind are not likely to be settled by talk and newspaper correspondence. We look for good result from Mr. Whalley's Act, for it most frequently lies in the power of a large landowner to make, at small cost, an adequate provision for the supply of water to his poorer neighbours, though they may sometimes be required to go some distance to fetch it.

#### BIRMINGHAM EXHIBITION OF GAS APPARATUS.

It is gratifying to learn that the interest taken by the public in this Exhibition was so great, that the Committee determined to keep it open for two days longer than was originally intended. More than 10,000 persons were admitted to the Town Hall, and upwards of 2000 availed themselves of the opportunity of attending the cooking lessons, given by the Ladies Useful Work Association.

In our last number, reference was made by name to some of the principal exhibitors in the various classes into which the cooking and heating apparatus were arranged. There were, however, several exhibits not mentioned, which should not be allowed to pass unnoticed. Amongst these we may mention the following collection of products arising from the manufacture of coal gas:—

	Exhibited by
Coke . . . . .	CORPORATION GAS DEPARTMENT.
Carbon . . . . .	
Ammoniacal Liquor . . . . .	
Tar . . . . .	
Spent Oxide . . . . .	
49 Samples of Coal Tar Products . . . . .	DOMETER AND CO.
Products from Ammoniacal Liquor . . . . .	
Ditto . . . . .	CHANCE, BROTHERS, AND CO.
Specimen of Ammonia Alum. . . . .	
Samples of Tar Products . . . . .	SOUTHALL, BROTHERS, AND BARCLAY.
Samples of Products from Spent Oxide . . . . .	
Samples of Tar Paving and British Asphalt . . . . .	G. SKEY AND CO., LIMITED.
Preparation of Carbolic Acid . . . . .	
Ditto . . . . .	J. BETHELL AND CO.
Samples of Coal Tar Derivatives . . . . .	
	GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.
	J. BRADSHAW AND CO.
	F. C. CALVERT AND CO.
	P. DOUGALL BROTHERS.
	P. HARRIS AND CO.

Amongst other miscellaneous exhibits, possessing great interest, may be mentioned:—

A 5-foot Gasholder, Test-Table, and Float of Lights . . . . .	LANCASHIRE GAS-METER COMPANY, LIMITED, FALCON WORKS, OLDEHAM.
Glazed Wet Meter . . . . .	
Glazed Dry Meter . . . . .	LOVETT AND WHITEHOUSE.
Collection of Gas-Burners . . . . .	
Self-Lighting Gas-Tap (lighttail, bat's-wing, and Argand). . . . .	G. TWIGG AND SON.
Experimental Meter, Collection of Burners, and Standard Gasholder . . . . .	
Collection of Burners . . . . .	CORPORATION GAS DEPARTMENT.
	STADELMANN AND CO.

When noticing the gas-engine exhibited by Messrs. Louis Simon and Son, of Nottingham, last week, it was remarked that it did not appear to work so economically as some others. Referring to this observation, Messrs. Simon and Son write as follows:—"We exhibited a 1-horse power 'Eclipse' gas-engine working up to 1½-horse power, and ran it with a friction brake on. So weighted, it used about 50 cubic feet per hour, naturally more than the other engine which was only driving itself, but less, we believe, than any engine doing the same work would. As by obtaining steam from the heat of the exhaust we utilize the full mechanical effect of the combustion, it is only to be expected that our engine would use little gas."

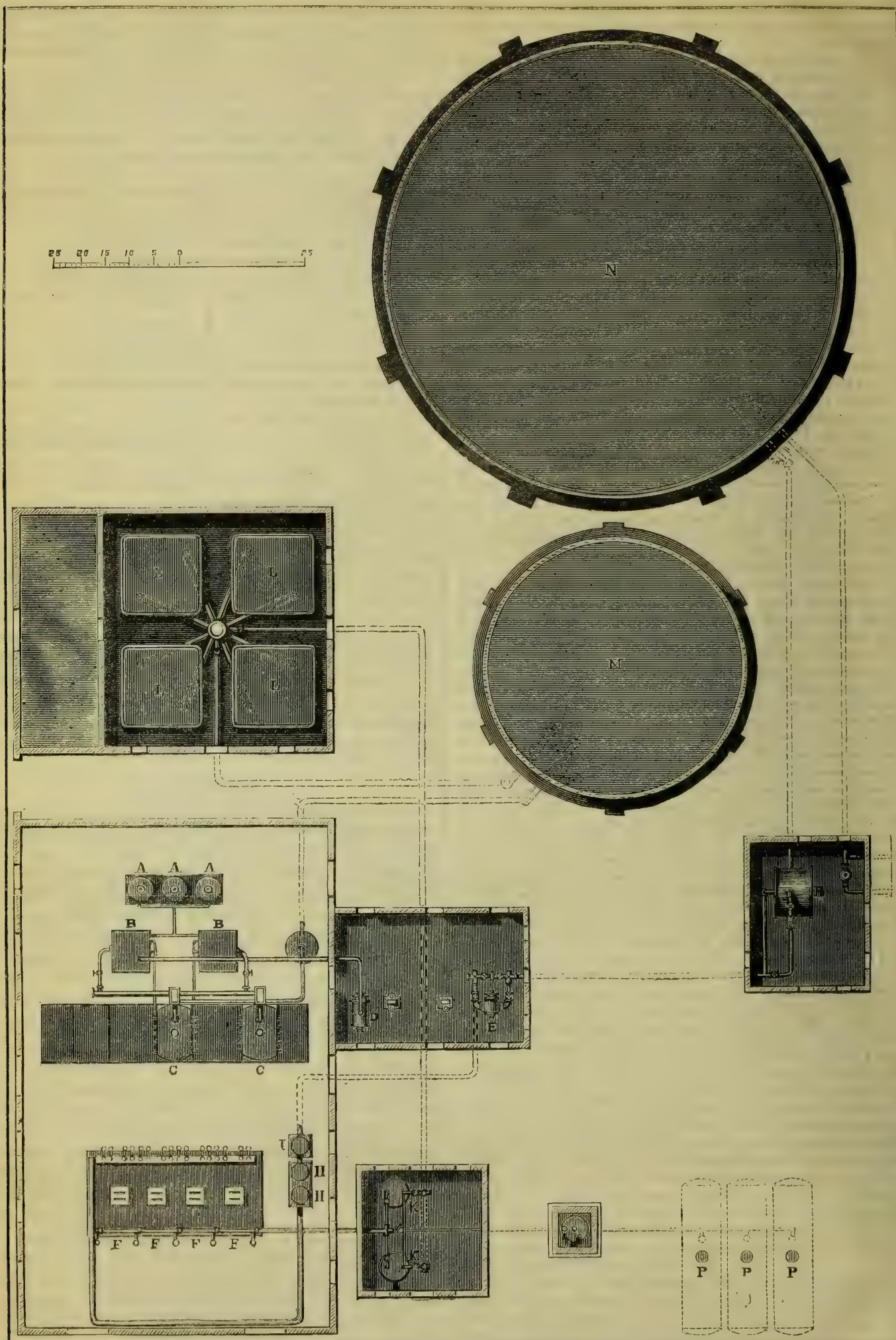
We have been requested to state that Mr. T. D. Clare, of Handsworth, exhibited his patent open-fire ventilating stove, adapted for burning coke, breeze, coal, slack, or gas, in addition to the gas-stove for which he received the silver medal in Class 11.

#### WATER GAS.

(Continued from page 910.)

The Municipal Gaslight Company of the city of New York were originated some three years ago. Their functions are the manufacture and sale of water gas, carburetted with naphtha to a high degree of luminosity, as a present business; and, as an adjunct to the business of the near future, the manufacture of a non-luminous gas for household heating, and for the use of various industries now dependent upon coal for fuel. The method of producing water gas which the Company employ (known in the United States as the Tessie du Motay system) is similar in principle to Kirkham's, and many others who have followed in his wake. But there are devices and adjuncts necessary to the production of a commercial gas which are the outcome of many experiments, some of them notable failures, which were instituted for, and at the expense of, the gentlemen who were the promoters of the Company, working under what is known as the Tessie du Motay patents. These have been added to and improved by the inventions of M. Jerzmanoski and others, and brought into practical shape by Mr. Thos. F. Rowland, of the Continental Works, Brooklyn. Mr. Rowland having had his attention called to the subject of water gas, in connection with a method of producing oxygen gas (also the invention of Tessie du Motay, which was introduced in the city of Buffalo, N.Y., some five or six years since, but proved a commercial failure), came to the conclusion that a thorough study of the details, and a practical carrying out of the scheme on a scale of sufficient magnitude, might make that a success in America, which, more than 20 years before, had been adjudged a failure in Europe. He therefore availed himself of the knowledge and experience of M. Jerzmanoski and other parties interested, and set to work to remove what he considered crudities, and to substitute other arrangements which he deemed necessary. This resulted in the erection of an experimental apparatus, with which he could produce gas having an illuminating power of 24 candles, capable of being consumed in any burner, and under all the circumstances to which gas, in the general way, is subjected. The satisfactory issue of this undertaking induced the gentlemen composing the Municipal Gaslight Company, under whose auspices all experiments were made, and who are the proprietors in the United States of the various patents under which the works are operated, to enter into an agreement with Mr. Rowland to build them works equal to the production of 500,000 cubic feet of gas per 24 hours, and equal in illuminating power to that produced by his experiments. On next page is a ground plan of these works.





PLAN OF EXPERIMENTAL WATER-GAS WORKS, CONSTRUCTED BY MR. T. F. ROWLAND, OF BROOKLYN, FOR THE MUNICIPAL GASLIGHT COMPANY, NEW YORK CITY.



A, A, A are the boilers that generate the steam required for all purposes. The steam to be converted, by decomposition, into combustible gas is raised to a high temperature by being passed through the superheaters, B, B. These also serve for the production of the hot blast, the air for which is supplied by the blower, D.

The gasogenes, or decomposing furnaces, C, C, are supplied with air and steam in a manner very similar to that specified by Kirkham, to which we have already referred. When the apparatus is fairly in operation, the coke or anthracite in these chambers is fully alight, and, therefore, only requires the hot blast turned on to either one of them, in order to bring a great portion of its contents up to a temperature expressed in Kirkham's specification, as equal to "the melting point of iron."

This heat having been arrived at, the blast by suitable means, is turned to the other gasogene, from which the steam is transferred to the one just spoken of as under the blast, so that by the time the steam has cooled this one below the decomposing temperature, the other will be again raised by the blast to the heat required to render its contents fit for the reception and decomposition of steam, and so on alternately and continually.

If we follow the pipes marked on the plan, we shall see that the gas from either of the gasogenes, after passing through a condenser, goes to the holder, M. From this holder, which acts as a mixer, the gas flows, as demanded, to the purifiers, L, L, and from thence to the carburetters, K, K. These are formed of a pile of pans, about 7 feet high, and so arranged that each pan has a certain quantity of naphtha in it, and is at the same time under the influence of a water bath that regulates its vaporization according to the rate at which the gas is passing over the naphtha surfaces. The gas having now become the bearer of hydrocarbon vapour, is conducted to retorts set in benches, F, F, and similar to those employed for the distillation of coal. Through a certain number of these retorts the gas has to pass to undergo the process called "roasting, or "fixing." This process is said to be so efficient that, after being stored in the holder, N (from which it is sent out for consumption), no miscarriage of luminosity is found to take place, even when tested for power at the most distant point of the district supplied. From the roasters the gas is drawn first through the condensers, H, H, and, finally, through a washer, I, by the exhaustor, E. From this machine it passes through the station-meter, R, to the gasholder, N, where it is stored for consumption.

The demand for the gas so manufactured was such that the power of the works soon became fully occupied, and consequently the Company, in the early part of the year 1877, contracted with Mr. Rowland for the erection of new works, now complete, that should be equal to a make of 3 million cubic feet per day, the particulars of which will hereafter appear in the JOURNAL.

About the time that the suggestions by Tessié du Motay were under trial in the State of New York, and led Mr. Rowland to investigate the water gas question, a patent was taken out in this country by Mr. Lake, on behalf of William Harkness, of the United States, for "An Improved Process and Apparatus for making Illu-

minating Gas." The inventor lays great stress on the novelty of the process and apparatus, "the peculiarities of which" he explains to be "the production of illuminating gas by decomposing steam, and uniting the resulting gas, together with the gases given off by red-hot coal when the steam is passed through it with hydrocarbon vapours, by which a permanent or fixed gas of high illuminating power may be produced at a cheap rate." One of the novelties of this latter invention is the decomposition of steam in a vertical generator wherein gas from coal is at the time being evolved, in the same manner as claimed by Manby, with the exception that Manby—as was the practice in those days—provided the temperature necessary for evolving the gas from the coal, by the combustion of fuel on the outside of the vessel, whereas Harkness burns that which is required for producing the temperature for carbonizing his coal and decomposing the steam, within, as suggested and put in practice by Kirkham—with this difference, however, that Kirkham, and those known to us who have followed him, blew up their furnaces or generators by heated air supplied by a blower, whereas Harkness induces the air to pass upwards through the charge of coal by natural or artificial draught, the coal being "allowed to burn until the mass of the coal is red hot." It must be remembered that during this time the valve in the "smoke-pipe" is open, and we presume that the gas from the coal is going up this pipe as smoke; it will, therefore, never, by combination with gases from "red-hot coal" and steam and hydrocarbon vapours, help to produce a fixed gas of high illuminating power, and at a cheap rate.

Another part of the invention claimed by Harkness as of great importance, is the passing of the steam to be decomposed "downward through the mass of incandescent coal in the generators," instead of "upwards," as practised ever since the internal firing has been in vogue. The reason for this inversion is based on an assumption that the levity of the gas formed in the lower portions of the decomposing furnace makes it so uncontrollable that it will pass up the easiest and shortest route, without, therefore, filling "the entire cross-section of the generator." This would undoubtedly be the case if the gas was passing into a partial vacuum, such as might be created by an exhaustor similar to that in use at the Municipal Works, but not while under pressure, as is the case there.

It will be seen, by reference to the plan of the Municipal Works, that the exhaustor has nothing to do with the gasogene, but has all to do with the remainder of the apparatus. In this case, pressure compels the cross sectional occupation, so essential to the proper development of the power of this important part of a water gas plant—the gasogene.

The last-named patentee prefers to work with two cylindrical generators, which in elevation look as much like vertical steam-boilers as possible, their chimneys, or "smoke-pipes," having valves in them for a purpose to be explained by and by. "The generators, are partly or nearly filled with coal," resting on gratings or fire-bars, over ash-pits, consequently ready for firing.

The accompanying drawing, fig. 3, shows a front elevation of the apparatus.

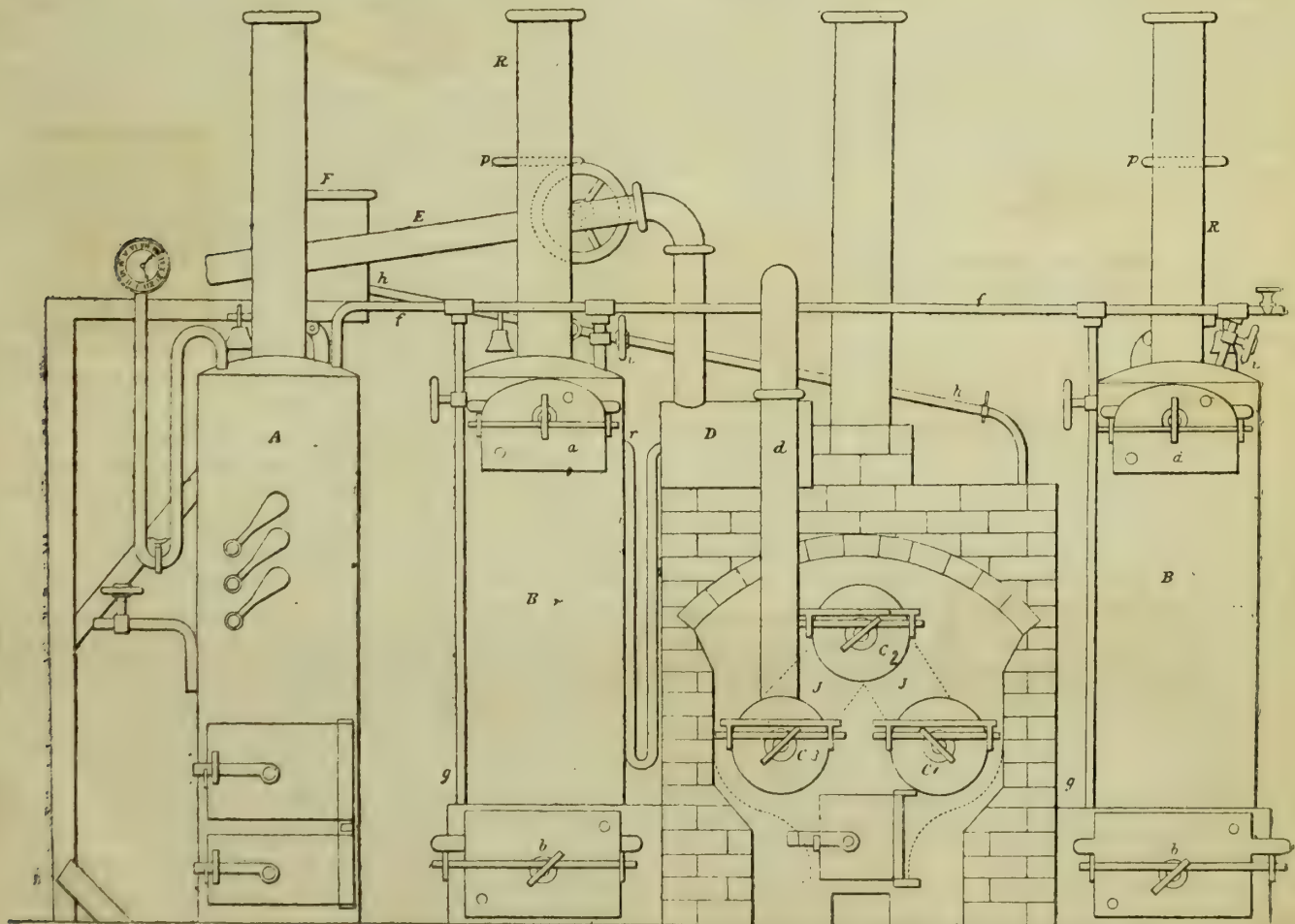


FIG. 3.



We must now suppose that the lids, *a* and *b*, are off, so that the ash-pits can be looked into, and the upper surface of the coal surveyed through the openings at *a*. As these generators are to be worked alternately, operations are commenced by kindling a fire under the coal in, say, the right-hand generator, taking care to open the valve, *p*, in the "smoke-pipe," *R*, in order to create the necessary draught. When the mass of coal is red hot, the lower door or lid, *b*, of the generator is closed, and rendered gas-tight by luting or otherwise. Steam is then admitted from the boiler, *A*, through the pipe, *g*, into the base of the generator, *B*, and, if the coal be of the proper temperature and condition, the steam thus admitted, as it ascends through the incandescent mass, will be decomposed and converted into a gas or vapour that will burn at the surface of the mass of coal. As soon as this is ascertained, the upper lid, *a*, is luted on, and the valve, *p*, in the smoke-pipe closed. We very much question the gas-tightness of this valve. If it be necessary to apply luting to the lids, *a* and *b*, for the purpose of preventing leakage, we think something more will be required in the "smoke-pipe" than what is proposed. The valve on the steam-pipe, *g*, is now closed, and the valve, *i*, is opened, to admit steam into the generator above the coal. It then passes "down through the mass of hot coal" to the ash-pit, from whence it passes into a pipe that connects both ash-pits, and is, therefore, common to both generators. On this horizontal

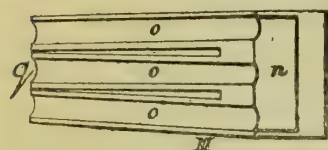


FIG. 4.

pipe is a vertical branch connected with the back mouthpiece of the through retort, *C*<sup>1</sup>, into which it flows. In the mouthpiece of this retort is placed a moveable casting, of which fig. 4 is a plan, that enters some little distance into the retort. It is called the vaporizer, and is sufficiently inclined to cause any fluid, dropped on the end nearest the retort-lid, to flow onward to the end, *q*, that is within the retort. The pipe that delivers the oil enters the mouthpiece close by the pipe conveying the gas, and that portion of the vaporizer, *n*, is so placed as to receive it. From this cross channel, *o, o, o*, grooves extend to the end of the implement; consequently the oil is supposed to be divided into as many streams as grooves; at any rate, as long as it retains its liquidity. The vapour and gas now travel together the length of this retort to the front, up the pipe, *j*, to the retort, *C*<sup>2</sup>, back to the rear mouthpiece of *C*<sup>2</sup>, down the pipe, *j*, to the rear end of retort, *C*<sup>3</sup>, passing from back to front, up the pipe, *d*, to the hydraulic main, *D*, and away to the gasholder through pipe *E*, a permanent and fixed gas.

The patentee says, "While one generator is being thus used, the other is being heated, and when the first has been run for about an hour, the steam is shut off from it and turned into the second one, the first being replenished with coal, and heated so as to be ready for use by the time the second is exhausted, and thus the operation is rendered continuous." It is claimed for this method that the gas produced by the process is carburetted hydrocarbon oxide, of a specific gravity of 700. It is also asserted by the inventor that the gas requires neither washing nor purifying, being entirely free from sulphur and phosphorus. Notwithstanding this statement, however, we can only say that, as surely as coal contains sulphur, and water hydrogen, so surely will the patentee, by his process, if he does anything, form sulphuretted hydrogen. The carbonic acid that will be left undecomposed is not mentioned, and therefore, perhaps, is not suspected; but it unquestionably will be found whenever the process is put into practical operation.

(To be continued.)

#### GAS AND ITS USE AS FUEL.

The question of promoting the use of gas as fuel for domestic and trade purposes is one that merits the special attention of all who are engaged in the manufacture and supply of that article. We therefore propose to offer a few suggestions in reference to the subject.

That coal gas possesses all the essential elements of a good and economical fuel is now placed beyond doubt. The experience of the last 30 years has proved its efficiency for almost every domestic purpose in which heat is required, and the variety of contrivances, for utilizing it in trade operations, which were brought together in the recent Exhibitions at Birmingham and South Shields show conclusively that manufacturers are beginning to realize its advantages in meeting other wants than those of the household. The supply of gas for any other use than that of illumination has, however, been treated by Gas Companies in past times too much as a mere incident in their operations, which only under peculiar conditions and circumstances was worthy of consideration. The development of this branch of their business has also been retarded by the bugbear of day pressure, and increased leakage, more labour for Inspectors, and longer columns in complaint-books. These and other objections have been raised by many Companies or their officials, and where decided obstacles like these have not been placed in the way, there has still been, on the part of the majority of Companies, a lukewarmness and want of cordial sympathy with any attempt to promote the use of gas for cooking and heating, so that if any advance has been made in this direction, it has, with few exceptions, been due to the energy and enterprise of private individuals, either as Consumers of gas or as Manufacturers of gas apparatus.

It now, however, seems to be a recognized duty of all Companies or Corporations interested in the sale of gas, to turn their attention to the subject, and as a commercial enterprise the increase in the use of gas in this direction will, after a moment's reflection, be seen to be a matter of the utmost importance.

For several years past the value of gas property has now and then been threatened by the introduction of some new mode of obtaining artificial light—Air Gas, New Gas, Eupion Gas, Petroleum Light Companies, and last, but not least, the Electric Light and Jablochhoff Candle, have all in turn had their effect on gas shares, and not a few timid holders have looked with dismay on what they feared might be the disastrous consequences, if these new luminaries should ever come into public favour. It must, however, be borne in mind that in thus judging of the influence any of the schemes might have on the value of gas investments, reference, in most instances, was only made to it as a source of light. It is true that some of the promoters of water gas have put forward extravagant claims in reference to its use as a source of heat, but a brief consideration of the impracticability of sending out mere non-luminous or heating gas at one part of the day, and carburetted or light-giving gas at night, through the same set of mains, would show that for all practical purposes water gas schemes can only compete with coal gas as lighting agents in the ordinary sense of the term. Such being the case, any means by which coal gas is rendered more valuable for other purposes than that of illumination must place it in a more independent and secure position.

Taking this view, it seems scarcely necessary to point out how largely the profits arising from the manufacture of gas might be increased if the plant necessary for the winter working could be utilized in the summer, or if the daily make of gas could be rendered more uniform throughout the year. In such a case the public would be immensely benefited, because they would be furnished with both light and heat at a cheaper rate; and the proprietors of gas-works would be equally benefited, because their property would be more fully utilized, and more completely secured from the risk of depreciation by the introduction of rival sources of light.

In tracing the history of gas lighting, there are some points which, from their significance, are worthy of attention at the present moment, and among them the fact of the small amount of actual interest displayed by Companies in extending the use of gas. Manufacturers of any article which they desire should be generally adopted exert themselves to show its superiority; they spare no pains to meet and overcome the prejudices of the public, and never rest satisfied until the commodity they are interested in has become an article of universal necessity. But Gas Companies, as a rule, have scarcely ever exhibited this desire to promote the sale of the article in which they deal. Gas was originally introduced to the public as a scientific novelty; its process of manufacture was for many years surrounded with an air of mystery; the very capital invested in its undertakings has always been looked upon as if exposed to more than ordinary risks; and any discussion of the commercial value of gas by its purchasers has been looked upon as an expression of hostility to the vested interests of the Companies who supply it. It is true this exclusiveness is gradually wearing off, and many Companies are beginning to see that they can afford to conciliate their customers without at all jeopardizing their material interests. Notwithstanding the enormous increase in the use of gas which has taken place within the last 20 years, still it may be safely asserted that if the Companies had shown greater interest in the way in which gas was used by their customers the growth of the trade in gas would have been far more rapid than has actually been the case. The apathy exhibited by Companies as to the proper employment of gas by consumers, has been the fruitful source of many of those jealousies and bickerings which have been so prevalent, and which, on many occasions, have led to bitter and expensive legal and parliamentary contests. A few pounds expended in supplying efficient burners, or may-be a day or two in a month of the time of a judicious and intelligent official employed in giving information as to meters and fittings, would, in many instances, have smoothed down hostile demonstrations, and have converted foes into friends. This want of direct interference in securing the profitable employment of gas for lighting purposes by the Companies who make and supply it, has been the mistake of the past; for the future, if they really desire to promote the use of gas for heating, their officers must exert more influence. It is quite certain the ultimate result will amply compensate for any time or trouble expended in directing the attention of manufacturers to what are the essential conditions to be observed in the construction of apparatus where gas is the fuel, and, on the other hand, in instructing consumers as to the kind of cooking or warming stoves best adapted to their circumstances and needs.

The Exhibition at Birmingham will, we believe, have taught some very important practical lessons to those Engineers and Managers who took the pains to carefully examine the articles exhibited. One very special matter was the amount of pressure required in some stoves as compared with others. In more than one instance there was an obvious deficiency of heat, owing to the absurdly small tubes and taps through which the gas was conveyed to the burners; whereas in others the pressure might have been reduced one-third, and yet an ample supply of gas have been obtained. Now as the use of gas for heating purposes will mainly take place when it is to the interests of Companies to have the smallest amount of pressure, it is obviously of the first importance that the manufacturers of stoves and other appliances should be fully alive to the necessity there is so to adjust the burners and fittings as to secure perfect efficiency at the lowest possible pressure. Another important matter connected with the use of gas for either cooking or heating purposes, and one that should receive the especial attention of both the manufacturer and the gas-fitter, is that of securing ample but controllable ventilation, so that the products of combustion, as well as the vapours given off during the process of cooking, may be rapidly and effectively carried away. The want of such provision was a defect more or less observable in nearly every stove exhibited at Birmingham. It is perfectly certain that unless sufficient space be afforded to permit of the escape of all the vitiated air from the stove through a proper channel, a



portion of such air will find its way into the kitchen or other apartment in which the apparatus is placed. It has been this want of proper ventilation in regard to gas-stoves that has made their use objectionable in many instances. No one would think of using coal or coke in a stove or grate in which no chimney was provided to carry off the smoke and other products of combustion, so no one should attempt to fix or use a gas-stove without having taken every precaution to secure ventilation into an existing chimney, or by means of an independent pipe or flue. Not only should precautions be taken to get rid of the products of combustion, but special attention should also be paid to the character of the burner, and the supply of air to it. An objectionable feature in many gas-stoves is that too large a volume of air is allowed to enter a stove, and only a small portion of it brought into such contact with the gas as to interfere with its perfect combustion. The disagreeable odour given off by some stoves is due to this cause. The uniformity of the size of the holes or jets, and the angle at which the flames are made to incline, are matters of some importance. In order to secure the best results in cooking apparatus, provision should also always be made for a current of air to pass under the dripping-pan. The absence of this precaution frequently causes the fat or dripping to become over-heated or charred, and, as a result, unpleasant smells are produced. Too much care cannot be taken to secure perfect simplicity of parts, and facility for keeping clean, in all gas cooking-stoves. These may appear trivial matters; but just as a bad burner, or a small pipe, may convert good gas into what appears to be bad, so may the want of attention to minor details mar the success of gas as fuel.

The objection frequently urged against the employment of gas for cooking—that it may impregnate the meat or other viands with noxious vapours—has been so ably met by Mr. F. W. Hartley, in his admirable paper on gas-cooking, that it is only necessary here to refer to the matter by saying that the objection is groundless, as no such contamination can by any possibility take place, except through wilful neglect.

The foregoing remarks have had more especial reference to the use of gas for culinary purposes, but they apply equally to its use for heating generally. Full-sized pipes and fittings, low and uniform pressure, and perfect ventilation, are as essential in the heating of baths, in hall, office, or bed-room stoves, or in laundries and workshops, as for the cooking-stove in the kitchen.

Before dismissing the subject, it may be thought desirable to say a word or two upon the use of gas as a motive power. Its application to this purpose seems scarcely to have received the amount of attention in this country that its importance deserves. The almost universal employment of steam generated by the use of coal or solid fuel, has hitherto diverted attention from nearly every other mode of obtaining motive power; but it is a question that merits consideration, whether there are not many processes now carried on in which mechanical power may advantageously be applied, but where the use of steam would be quite impracticable. In such situations the gas-engine meets the difficulty. That such engines can be used with advantage, their extensive employment in Paris, and in other cities on the Continent, is a sufficient proof. One great objection hitherto raised against them in this country has been that they are not so economical as steam-engines of equal power; but, after all, economy is only a relative term. It will be freely admitted that the cost of a pound of coal is less than that of 20 feet of gas; but the time and labour, in making proper use of the former, may eventually make it more expensive. Besides, the one can only be used under very special conditions, whereas the other may be used quite apart from such conditions, and thus meet all the requirements of the case. Under such circumstances the costlier agent is the better, because it accomplishes what the other cannot. It is not, however, in competition with steam that gas-engines can hope to succeed; but in cases where steam is inadmissible. There an engine propelled by gas may be perfectly successful, and on these grounds it is that the attention of the manufacturers of gas should be directed to gas-engines, in order to encourage the use of such machines.

In a future article we propose to offer some remarks on the treatment of residuals, suggested by the exhibition of specimens at Birmingham.

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### AIR AS FUEL.

SIR,—Our furnace, noticed in your issue of the 28th ult., is not quite similar to the "very, very old face" portrayed in Mr. Gore's letter published on the 4th inst.

Whether his recollection is accurate or not is really, however, of little moment. No one surely would think of patenting in principle the introduction of air over the fuel, because, no doubt, it has been done over and over again, not only by the parties he names, but also by others. The real question is, Has it been done exactly in the way we do it, and has the process been published to the world so as to invalidate our patent? We think not, and we think besides that there are accessories connected with our furnace which are essential, and which have not before been employed.

We thank Mr. Gore for the information he furnishes.

Aldershot, June 14, 1878.

WILSON AND DOUGLAS.

### THE TEMPERATURE OF GAS IN ASCENSION-PIPES.

SIR,—In reply to Mr. Newbigging, I may say that my letter in your issue of June 4 was written mainly to combat his suggestion that

Mr. R. O. Paterson had not accurately tested the heat of gas in the ascension-pipes, as the following extract from his letter of the 14th of March will show:—"If he (Mr. R. O. Paterson) will pursue the subject further, he will probably come to the conclusion that the temperature he found so near to the mouthpiece was not that of the issuing gas, but the heat from the retort, or the heat transmitted by conduction to the stand-pipe." In his letter of the 11th of June, Mr. Newbigging charges me with coolly ignoring his letter of the 28th of May, detailing experiments made by him on this subject, in which he goes on to say "that the high temperatures which Mr. R. O. Paterson found in the ascension-pipes were not those of gas at all, but were chiefly due to the volatile tarry matter in suspension therein."

Compare the opinion here last expressed, as to the source of heat, with that given by Mr. Newbigging in his letter of the 14th of March, and perhaps you will agree with me that he is as great an adept as myself at coolly ignoring letters—even his own.

T. A. COLLINGE, Analyst.

Rochdale Corporation Gas-Works, June 15, 1878.

### REVIVIFICATION OF SPENT LIME.

SIR,—It was with not a little surprise that I read the article under the above heading in Part 19 of your "Treatise on Coal Gas," issued this month. My process is therein represented to consist in moulding the spent lime, containing all impurities, into bricks before recalcination, and that, therefore, the sulphur is not only commercially lost, but largely fixed in the process of burning, and so rendering the lime soon valueless by converting it into the form of sulphate.

Such a statement is at variance with facts, and is calculated to prejudice the mind of the reader against the process, and appearing as it does in a valuable standard work, it is all the more unfortunate.

The moulding of the lime into bricks was once tried only by way of experiment some five years ago, and found objectionable.

With regard to the sulphur, my process provides for its effectual removal from the lime and absorption into oxide of iron, and that chiefly while in the purifiers, by means of the products of combustion, CO<sub>2</sub>, from the retort furnaces or the lime chambers, or from both. Any remaining sulphur is removed by the carbonic acid liberated from the lime in the highly-heated recalcining chambers passing over, and in contact with, the foul lime in the upper and colder, or desulphuretted, chamber. When oxide of iron is employed along with lime, the purifiers may be so worked as to obtain the lime with very little sulphur, and any that may remain is removed in the desulphuretted chamber referred to.

And as regards the durability of the lime, it will be sufficient to state that after 70 recalcinations effected at one-half the original cost of lime, it is found to contain only 2½ per cent. of sulphur.

Paisley Gas-Works, June 14, 1878.

GEO. R. HISLOP.

### SEWAGE GAS.

SIR,—As Mr. Stephan's process of making gas from sewage appears to be exciting some little interest just now, I venture to send you the results of some experiments which I made on the Wrexham sewage sludge on Dec. 6, 1877. The experimental retorts at the Rochdale Gas-Works were charged with 4 cwts. at a time—six-hour charges—the retorts being worked at a temperature of 1000° Fahr. by Siemens's pyrometer. The reason why I worked at so low a temperature is that I was desirous of ascertaining the amount of ammoniacal liquor which could be obtained, as the sludge contained nitrogen equal to ammonia 2:1 per cent. The following was the result of my experiments:—

Moisture before putting into retorts . . .	9.14
Purified gas, per ton . . . . .	46.69 cubic feet.
Unpurified gas, per ton . . . . .	56.96 "

#### Analysis of Unpurified Gas.

Carbonic acid . . . . .	19.50 per cent. by vol.
Sulphuretted hydrogen . . . . .	2.50 "
(Remaining portion chiefly carbonic oxide and hydrogen.)	
Residue from retorts . . . . .	11.75 cwts. per ton.
65 gallons of ammoniacal liquor, containing	4.85 per ct. of ammon.

#### Analysis of Residue from Retorts.

Carbon . . . . .	15.31
Insoluble silicious matter . . . . .	45.62
Oxide of iron and alumina . . . . .	14.89
Carbonate of lime . . . . .	15.91
Phosphate of lime . . . . .	3.41
Alkaline salts, including magnesia . . . .	4.86

Total . . . . . 100.00

If you will multiply the carbon in the residue from the retorts by three, and divide the other bodies present in the analysis by two, you will have a rough approximation to the composition of the sludge prior to its being put into the retorts. I may just say that I did not contemplate substituting a gas made from sewage sludge for coal gas; but I would explain that dried sludge has a theoretical value of about 30s. per ton—i.e., nitrogen equal to 2 per cent. of ammonia at 15s. per unit—but as the nitrogen is in an insoluble state, and is very slow in its action on the land as a fertilizer, the sludge is not in request by farmers, and, in fact, by its excessive accumulation it has become such a nuisance that at Birmingham, for instance, they have been compelled to dig it into the land to get rid of it. According to these figures, the theoretical value of the products from 100 tons of dried sludge ought to be about £80; that is to say, after the ammoniacal liquor has been made into sulphate of ammonia. The question I am now engaged upon is this: How much fuel would be required to carbonize and dry the sludge, using, of course, all the waste heat for drying the sludge prior to its being put into the retorts. The gas from the sludge could also be used to heat the retorts, or a portion could be carburetted and used on the works for lighting purposes. I must add that the gas burns with a non-luminous blue flame.

T. A. COLLINGE, Analyst.

Rochdale Corporation Gas-Works, June 15, 1878.







The Registrar-General publishes the following returns of the average daily quantity of water supplied by the London Water Companies during the month of May, 1878. According to these, 125,453,161 gallons, or 569,991 cubic metres of water (equal to about as many *tuns* by measure, *tons* by weight) were supplied daily; or 230.5 gallons (104.7 decalitres), rather more than a *ton* by weight, to each house, and 32.5 gallons (14.8 decalitres) to each person, against 31.1 gallons in May, 1877.

COMPANIES.	Number of Houses, &c., supplied in		Aver. Daily Supply of Water in Gallons* during	
	May, 1877.	May, 1878.	May, 1877.	May, 1878.
Total supply . . . . .	532,613	544,217	117,591,830	125,453,161
From Thames . . . . .	250,034	257,295	59,218,609	62,788,068
„ Lea and other Sources . . . . .	282,579	286,922	58,373,221	62,665,093
THAMES.				
Chelsea . . . . .	28,741	29,014	7,560,600	8,723,200
West Middlesex . . . . .	49,162	50,677	10,334,504	10,187,794
Southwark and Vauxhall . . . . .	78,000	80,431	17,750,000	18,350,000
Grand Junction . . . . .	37,683	38,462	10,698,605	12,333,974
Lambeth . . . . .	56,448	58,711	12,874,900	13,188,100
LEA AND OTHER SOURCES.				
New River . . . . .	125,180	126,629	25,973,000	28,305,000
East London . . . . .	111,967	115,143	25,403,400	26,400,000
Kent . . . . .	45,432	45,150	6,996,321	7,960,093

\* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for May, 1878, as compared with that for the corresponding month of 1877, shows an increase of 11,604 houses, and of 7,861,331 gallons of water supplied daily.

## PARIS UNIVERSAL INTERNATIONAL EXHIBITION, 1878.

### BRITISH EXHIBITORS.

The following, taken from the Official Catalogue, is a List of the British Exhibitors of Gas, Water, and Sanitary Appliances:—

#### GROUP III.—Class 27.—Apparatus and Processes for Heating and Lighting.

- ABRAHAM, A., Elgin Road, London.—Revolving Advertising Lamp.
- LEONI, S., AND Co., St. Paul Street, London.—Gas Oven for roasting or baking. Gas Hot Plate. Gas Kitchen. Patent Multiple Gas Boiler, with Steamer, &c. Gas Hot Closet. The Lady's Summer Kitchen, and other small gas apparatus for domestic purposes.
- LONGDEN AND Co., Phoenix Foundry, Sheffield.—Gaselier in the English style of the seventeenth century. Tiled Stove, with Gas Heating and Reflecting Apparatus.
- PARIS, J., Stratford, Essex.—Portable Ironing Table, with Apparatus for Forcing Air, and also for making the gas required for Heating, adapted for cooking, brazing, soldering, glass blowing, chemical and general experiments, to be used with ordinary gas, or with the gas made within itself.
- SCANLAN, JUN., AND Co., Walsall.—Apparatus for Heating and Cooking by Gas (Leoni's Patent).
- WRIGHT, JNO., AND Co., Essex Works, Birmingham.—Gas Cooking Apparatus and Boiling Stoves in various sizes. An Oven for Gas Cooking Apparatus. A Bath with Gas Cooking Apparatus. Gas Heating Stoves, "Brilliant," "Imperial," and Ventilating, of various sizes. Stannate Bronze-metal Gas Brackets and Chandeliers. Cases of Stocks and Dies for Engineers and Gas-Fitters, "Eclipse" Gas-Making Apparatus.

#### GROUP V.—Class 43.—Mining Industries, Raw and Manufactured Products.

- CAMBRIAN PATENT FUEL COMPANY LIMITED, Cardiff.—"Cambrian" Patent Fuel, an agglomeration of the best Welsh "Smokeless" Steam Coal and Coal Tar Pitch, pulverized and subjected to a dry heat process in patented machinery, to eliminate all traces of sulphur and other deleterious particles incorporated with coal tar pitch, and subjected to a pressure equal to 70 tons per block.
- HARPER AND MOORES, Stourbridge.—Fire Clays in their raw state, and refractory materials.
- HOUGHTON, W. D., Warrington.—Brass Pinion Wire for Gas and Water Meters.
- LONDONDERRY, Marquess of.—Londonderry Gas Coal for the Manufacture of Gas and Coke.
- MARSHALL, R., Glasgow.—Sample of rich Cannel or Gas Coal, called the "Marquis of Lothian's New Battle," yielding 12,573 cubic feet of 33.8 candle gas per ton, and 1046 lbs. of excellent coke, containing only 3.9 per cent. of ash per ton. Sample of rich Cannel or Gas Coal, named "Old Wemyss," yielding 13,320 cubic feet of 32.62-candle gas, and 1035 lbs. of coke, containing 26.50 per cent. of ash per ton.
- MASON AND Co., Leith.—Cannel Gas Coal for manufacturing Gas in large volume of great purity and high illuminating power.
- PALMER, MORGAN, AND Co., Cardiff.—Gas Coal.
- SOUTH DERWENT COLLIERY COMPANY, Newcastle-on-Tyne.—A block of West Pelaw Main Gas Coal. A lot of above Coal screened as delivered to Gas Companies. Samples of Coke as made from the same Coal at the Paris Gas Company's works, and at the Colliery coke-ovens.
- THIRSCUTT AND BALE, St. Austell.—China Clay or Kaolin in its raw or rough state, prepared for shipment, fired, and manufactured.
- WALKER, JAMES, Leeds.—Samples of Kaolin and its productions.
- WIGAN COAL AND IRON COMPANY, LIMITED, Wigan.—Specimens of Arley Coal used principally for gas-making and household purposes. Specimens of Cannel used for gas-making and producing a large quantity of gas of a high illuminating power.
- GROUP V.—Class 47.—Chemical and Pharmaceutical Products.
- BROOKE, SIMPSON, AND SPILLER, Hackney Wick.—Series of Dyes, Colouring Matters, and other products derived from Coal Tar.
- FAYOLLE, G., Mark Lane, London.—New Fast Aniline Dyes, produced by a new process.
- GRIFFITHS, FLETCHER, AND BERDOE, Liverpool.—"Griffiths's Patent White," a non-poisonous substance of snowlike whiteness, of permanent colour, and totally unaffected by sulphuretted hydrogen gas or atmospheric influence.
- LEVINESTEIN, L. J., AND SONS, London Bridge.—Aniline Dyes, and raw materials for their manufacture.
- LOWE, C., AND Co., Manchester.—Products from Coal Tar, Carbolic Acid, and its derivatives.
- OAKBANK OIL COMPANY, LIMITED, Glasgow.—Specimens of Shale, and of the products obtained from it by distillation and refining, Kerosine, Paraffin Scale, Sulphate of Ammonia, &c.
- SIMPSON, PAYNE, AND Co., Millwall.—Sulphate of Ammonia, &c.
- WILSON AND Co., Mile End.—Aniline Dyes, &c.

YOUNG'S PARAFFIN LIGHT AND MINERAL OIL COMPANY, LIMITED, Glasgow.—Bituminous Shale and Coal. Crude and Partially Purified Oils and Paraffin from Shale. Sulphate of Ammonia and Shale. Naphtha, &c.

#### GROUP VI.—Class 50.—Apparatus and Processes of the Art of Mining and Metallurgy.

- BRACKELL, C., Westminster Chambers, London.—Gas Exhausters, Water and Sewage Pumps, &c.
- DIAMOND ROCK BORING COMPANY, London.—Sample Cores obtained by the Diamond Rock Borer. Crowns showing setting of Diamonds.
- PROTECTOR LAMP AND LIGHTING COMPANY, LIMITED, Manchester.—Safety Lamps and Lighting Apparatus for Collieries. Model of Patent Gas-Making Apparatus.
- SAVILLE STREET FOUNDRY COMPANY, LIMITED, Sheffield.—Patent Rotary Pump, &c.
- TAYLOR, H. E., Newgate Street, London.—A Chester Pump for Forcing Water, applicable to Mines, Collieries, Water-Works, &c.

#### GROUP VI.—Class 53.—Apparatus used in Chemistry, Pharmacy, and Tanning.

(Processes and Apparatus used in Gas-Works.)

- COWAN, W. AND B., London, Manchester, and Edinburgh.—Warner and Cowan's Self-Regulating Gas-Meter, and three cylinders to show construction.
- GENERAL HEAT AND LIGHT COMPANY, LIMITED, Battersea.—Apparatus for Generating Heating Gas at a cost of about 4d. per 1000 cubic feet. This gas is chiefly used for cooking and heating purposes, and for singeing yarns or threads in spinning-mills. It is also very good as a lighting gas if carburetted with petroleum spirit.
- GIBBONS, B., JUN., Dbdale Fire-Clay Works, Lower Gornal.—A round Retort, hand made (old process). A D-Retort, machine made (new patent process). Sections of machine-made retorts in the "rough," and without being finished. Burs, Bricks, Tiles, &c. Fire-clay, raw and unprepared, and burned. Fine Fire-Clay Cement, Fire-Bricks, Blocks, Models, &c. Fire-Clay, natural and prepared.
- MACKRILL, THACKER, AND Co., Aylesbury.—Models of Gas-Works.
- SUGG, W., Westminster.—Gas Apparatus, Illuminating Power Meter, and Kirkham and Sugg's Improved Jet Photometer, both showing illuminating power of gas. Experimental Meter with central dial, showing the consumption of gas per hour. Patent Dry Gasholder, with flexible joints. Patent Street Governor, also another with glass cover. Patent Double Dry Consumer's Governor, also another with glass cover, to show action of diaphragms while in actual use. Various Gas Burners, Argand and others.
- THE SUN AUTO-PNEUMATIC LIGHTING AND HEATING COMPANY, Southwark Street, London.—A Machine for making Gas from Gasoline without coal or heat, specially adapted for lighting country houses, churches, &c., where coal gas is not obtainable. A Street-Lamp, which makes Gas as it burns, the light from which is as cheap as coal gas at 3s. per 1000 cubic feet. An Oil Lamp Burner and Gas Burner. The particular features in these are a series of vertical diaphragms in the ventral air space, by which the air currents are regulated.
- TICE, W., Southport.—Tice's Improved Dry Gas Regulator, for economizing and equalizing the pressure of gas. Tice's Radiating Street-Lamp Regulator, to supply any given number of cubic feet per hour.
- WRIGHT, JNO., AND Co., Essex Works, Birmingham.—"Eclipse" Gas-Making Apparatus, for private houses, railway stations, &c.
- WRIGHT, W., Sheffield.—A Patent Atmospheric Gas-Making Apparatus. An Atmospheric Gas-Stove. A Common Coal Gas-Stove.
- GROUP VI.—Class 54.—Machines and Apparatus in General.
- ADAIR AND Co., Liverpool.—Pumps, Fire-Engines, &c.
- ALLEY AND MACLELLAN, Glasgow.—Patent Sluice Valve for Water-Works, having four gun-metal faces and screw. Patent "Clear-way" Ball Hydrant, having internal cup shield to prevent the ball being forced into the inlet from the main. Patent Air Valve with cup shield, to prevent the rush of air lifting the ball, and preventing further outlet from the main. Patent Water-Meter for household and general use. A Pressure Transmitting Meter, having a continual flow. Alley's Patent Bearing Feeler, an instrument for giving warning by sound or otherwise when bearings of machinery wear.
- APPLEBY BROTHERS, Emerson Street, London.—Steam Cranes, Steam Lifts, Winding and Pumping Engine, Vertical Steam Pumps, &c., &c.
- BERNAYS, J., Newgate Street, London.—Centrifugal Pump, &c.
- BLUNDELL, G. T. AND J. W., West India Road, London.—Waterwitch Pump. Duplex Fire-Engine and Pump. Self-acting Lavatory. Double and Single Valve Water-Closets. Under Water-line Water Closet, &c.
- BROWN, B. AND J., AND Co., Charlotte Street, Blackfriars, London.—Gas-Meters, Gas-Lamps, &c.
- DEURANCE, J., AND Co., Great Dover Street, London.—Cocks, Water-Gauges, Valves, &c.
- GWYNNE AND Co., Essex Works, Strand, London.—Combined Centrifugal Pumping Engine, with Air Charging Pump complete, for raising wrecks, salvage purposes, surface condensers, drainage and irrigation. Combined Gas Exhauster and Steam Engine, for extracting gas from retorts, and passing it through the purifiers, with regulator and gas-valves. A small size Gas Exhauster as above. Three ordinary Centrifugal Pumps, with all the latest improvements; the internal disc and shaft can be taken out and replaced in a few minutes. Two Retort Lids for sealing the mouths of gas retorts simultaneously. A small Turbine Water Wheel.
- GWYNNE, J. AND H., Hammersmith.—One 5-inch Vertical Centrifugal Pumping Engine. One 9-inch Centrifugal Pump, with horizontal suction and vertical discharge, with one standard to bed plate. One 7-inch Pump, with two standards, and fast and loose pulleys. One 6-inch Pump on carriage, and one 12-inch Pump. Case containing Model (one eighth of full size) of pair of 54-inch Direct Acting Centrifugal Pumping Engines, &c., &c.
- HAYNES, T., AND SONS, Edgware Road, London.—Pumps, Hydrants, &c.
- HYDRAULIC ENGINEERING COMPANY, LIMITED, Chester.—Pumps, Hydraulic Engines, &c.
- LAWRENCE AND PORTER, Westminster.—Portable Centrifugal Steam Pumping Machinery.
- LE GRAND AND SUTCLIFF, Bunhill Row, London.—Model of Norton's Abyssinian Tube Well and Driving Apparatus, &c., &c.
- LOEWENTHAL, L., Harrow Road, London.—New Patent Gas Fire Engine, and Apparatus for instantaneous extinction of fire in buildings, ships, mines, &c., &c., and for preventing spontaneous or other combustion, explosions, or over-heat, by the use of patent astral gas with or without water. Respirators, Syphons, Drinking Foun, tains, &c.
- M'KENZIE, T., AND SONS, LIMITED, Holborn Viaduct.—Lefell's Patent Double Turbine Water-Wheel, 23 inches diameter, for driving all sorts of machinery where water power is available; with a 30 feet fall, will give 55-horse power.



MARTINEAU AND SMITH, Birmingham.—Cocks, Valves, and Fittings for Steam-Engines, Water, &c.  
 MAY AND MOUNTAIN, Birmingham.—Hydrants and Stand Pipes, &c.  
 MERRYWEATHER AND SONS, London.—Steam Fire-Engines, Hand Pumps, India Well Pump, Lift and Force Pumps, Compound Stationary Steam-Pump, Hydrants, Stand Pipes, Valves, Water-Meters, &c.  
 MÜLLER, H. L., Birmingham.—Alpha Patent Portable Gas-Making Apparatus, to make gas from gasoline.  
 PULSOMETER ENGINEERING COMPANY, LIMITED, London.—A selection of Pulsometer Steam Pumps, Water-Meters, &c.  
 RUSSELL, JNO., AND CO., LIMITED, Walsall.—Gas and Steam Tubes, Bends, Tees, Elbows, and Flanges. Brass Gas Cocks and Swivels, &c., &c.  
 SCANLAN, JUN., AND CO., Walsall.—Steam Cocks, Water Cocks, Pumps, &c.  
 SHAND, MASON, AND CO., London.—Patent Steam Fire-Engine, Hydrants, Hose Reel, &c., &c.  
 SIMON, L., AND SON, Nottingham.—Gas-Engines, &c.  
 STANNAH, J., London.—Patent Pendulum Donkey Pumps, &c.  
 TANGYE BROTHERS, Birmingham.—“Special” Direct Acting Pumps, “Special” Direct Acting Fire-Engines, &c., &c.  
 TAYLOR AND CO., Holloway.—Patent Cast-Iron Pipe or Column Cutter for cutting a continuous length of pipe in a trench or building without removal.  
 TURNER, F. W., St. Albans.—Portable Pumps, Hydraulic Motors or Water Pressure Engines, for driving any description of machinery by town water pressure or other source of supply. Pumps for domestic purposes.  
 TYLER (HAYWARD) AND CO., London and Luton.—Model of Cope and Maxwell's Patent Direct Acting Pumping Engines, Donkey Pumps, Hot Air Engines, &c.  
 WHITLEY, J. R., Didsbury.—Stop Valves for Steam and Water Pipes and Mains, &c., &c.  
 WILSON, A., AND CO., Vauxhall.—Direct Acting Steam Pumps, &c.

GROUP VI.—Class 61.—Machines, &c., used in various Works.

KENNEDY PATENT WATER-METER COMPANY, LIMITED, Kilmarnock.—A Positive Water Meter, which actually measures the quantity of water passing through it.  
 GROUP VI.—Class 66.—Apparatus and Processes of Civil Engineering, &c.  
 ABBENANT IRON WORKS AND COLLIERY COMPANY, Glyn-Neath.—Dinas Silica Fire Bricks, Clay, Cement, and Sand.  
 BROOKE, E., AND SONS, Huddersfield.—Sanitary Tubes, Fire Bricks, and Quarries, Sewer Ventilators, Gas Retorts, &c.  
 CHEAVIN, G., Boston.—Filters, &c.  
 CLIFF, JOSEPH, AND SONS, Wootley.—Series of Fire Clay Retorts, made by their own patent machine. Drain Pipes of all sizes and kinds. Traps, &c. Patterns of Fire Bricks and Lamps of all kinds, &c.  
 DOULTON, H., AND CO., Lambeth.—Sanitary Stone Ware, &c.  
 DOULTON AND WATTS, Lambeth.—Stone Ware used in the manufacture of chemicals, &c.  
 DUNNACHIE J., Glasgow.—Fire Bricks as used in the Siemens' furnace. Samples of Glenboig Star Fire Clay. Hislop's built Gas Retort, &c.  
 GLENBOIG FIRE CLAY COMPANY, Glasgow.—Gas Retorts, Sewage and Water Pipes, &c.  
 HARPER AND MOORES, Stourbridge.—Fire Bricks, Fire Clays, Crucibles, Gas Retorts, Melting Pots, &c.  
 HARRISON, G. K., Stourbridge.—Stourbridge Fire Clays in natural state, as raised from their mines. Specimens of the same after having been subjected to intense heat, showing no contraction. Stourbridge Fire Bricks. Gas Retorts in one piece, and Bricks for making same in segments.  
 HOLLICK AND CO., Greenwich.—Portland Cement in powder for hydraulic works, &c.  
 HOWORTH, J., Farnworth.—Revolving Archimedian Screw Ventilators, self-acting by wind, or driven by motive power.  
 JENNINGS, G., Lambeth.—Sanitary Appliances.  
 KING BROTHERS, Stourbridge.—Specimens of best Fire Clays produced from their mines, also specimens of the same Clay subjected to intense heat, to show how little it contracts or is affected by it. Specimens of Fire Bricks and Gas Retorts, &c.  
 PLYMOUTH FIRE CLAY COMPANY, Gunnislake.—Fire Bricks, Fire Clay, &c.  
 RAMSAY, G. H., Newcastle-on-Tyne.—Fire Clay, Retorts, Fire Bricks, Sanitary Pipes, Coke, Garesfield Coke, Cannel Coal, Gas Coal, Coking Coal.  
 SCOTT'S SEWAGE COMPANY, LIMITED, South Kensington.—Portland and other Cements from Water Carriage Sewage, Ammonic Fimus Manures made from dry excreta.  
 SILICATED CARBON FILTER COMPANY, Battersea.—Water Filters.  
 SMEATON AND SONS, Wych Street, London.—Baths, Urinals, Water Waste Preventers, &c.  
 STIFF, J., AND SONS, Lambeth.—Drain Pipes, Sewer Traps, Water Filters, &c., &c.  
 STONE, J., AND CO., Deptford.—Waste Preventing Valves and Taps, &c., Hydrants, Stand Posts, Sluice Valves, &c.  
 TYLER, J., AND SONS, Newgate Street, London.—Patent Water Meter and Fittings. Waste Preventing and Sanitary Apparatus.  
 WHITEHEAD, J., AND CO., Preston.—A Direct Action Steam Machine for the Manufacture of Earthenware Sewage Pipes, Fire Clay Gas Retorts, and Pipes for the Flow of Chemicals, &c.  
 WHITE, SUTCLIFFE, AND SON, Halifax.—Water Taps, Bath and Lavatory Taps, Steam Valve Taps, &c.

BOLTON CORPORATION GAS DEPARTMENT.—The writer of “Town Talk,” in the *Bolton Weekly Guardian*, says: “The Bolton Corporation appear to me to be a most unfortunate body. They—I speak of the ruling majority—seem to be always in hot water or at loggerheads with their servants. Sometimes they discharge their servants, and sometimes the servants discharge them. There are changes without end, changes startling and stupendous. I hear recently that a servant of high standing in Corporation favour has had some cause given him to think of sending in his resignation. The Gas Committee—though the press has been forbidden to publish it—and the Corporation official, don't appear to have hit the nail of happy accord altogether on the head, and it is rumoured that the Manager and the Committee are about to part company. Whether Mr. Veevers is leaving Bolton or not, or is shifting his quarters to more congenial latitudes, I don't know, but it has oozed out recently that the Committee, with their energetic Chairman at their head, have felt disposed to effect a change in the gas department. The Committee, it seems to me, are rather inclined to be crotchety, and like all smart people, very hard to please. Mr. Veevers, it is well known, is a gentleman of great technical knowledge; clever and industrious. If anything, perhaps his knowledge is too excessive for Bolton, and it does not always suit a Committee to have for their servant a man who is wiser than themselves. If Mr. Veevers leaves Bolton, Bolton will lose one of the most intelligent Gas Managers in England. The ratepayers ought to call the Committee to account for what they have done, or, as it is said, contemplate doing.”

SOUTHWARK AND VAUXHALL WATER COMPANY.

The Half-Yearly General Meeting and an Extraordinary General Meeting of this Company were held on Thursday, the 13th inst., at the Offices, Sumner Street, Southwark—HENRY WHITING, Esq., the Chairman, presiding.

The SECRETARY (Mr. Alfred Jelley) having read the advertisement convening the meetings, the seal was affixed to the register of Shareholders.

The following report was taken as read:—

The Directors beg herewith to submit to the proprietors the half-yearly statement of accounts of the Company to March 31, 1878, which have been duly certified by the Public Auditor appointed by the Local Government Board, and by the Auditors of the Company.

The various Bills brought before Parliament affecting the water supply of the Metropolis have been withdrawn, and your Directors regret that, in consequence of these proceedings, the Companies have again been put to considerable expense.

A Bill promoted by the Thames Conservancy has been introduced into the House of Commons “for conferring on the Conservators of the River Thames further powers,” &c., proposing that the several Metropolitan Water Companies drawing their supply of water from the Thames, shall each pay a further annual sum to the Conservators, irrespective of, and in addition to, any payments already made by the Companies. This Bill has been referred to a Select Committee of the House. Your Directors have thought it desirable to join the other Metropolitan Water Companies in opposing this Bill.

During the past half year 5652 yards of new main have been laid, of which 80 yards are outside our parliamentary area, rendered necessary in consequence of previous arrangements for supplying the district.

Eleven thousand five hundred pounds of the Company's mortgages, averaging 4½ per cent. interest, having come to maturity during the half year, have been paid off, and your Directors have placed a like amount of the Company's 4 per cent. Perpetual Debenture Stock in lieu thereof.

Tenders for the supply of coal have recently been obtained by advertisement, and a contract at reduced prices has been entered into for two years supply.

The reconstruction of the filter-beds, both at Battersea and Hampton, has been continued during the half year, and has resulted in further improving the quality of the water supplied. Your Directors have, however, much pleasure in stating that this important work is now approaching completion.

A special general meeting will be held immediately after the general meeting, at which a resolution will be submitted to the proprietors for the creation and issue of debenture stock to such amount as may be authorized, in exchange for mortgages or debentures now existing.

Your Directors recommend that a half year's dividend at the rate of 3 per cent. per annum, on the ordinary stock and class D shares, and 5 per cent. per annum on the preference stock and the preference shares of the Company, be declared payable on and after the 15th of July next.

The extraordinary charges against revenue have, as in the previous half year, very much diminished the dividend, but your Directors have the satisfaction to state that the Company is steadily improving its position.

Dr.—REVENUE ACCOUNT, FOR THE HALF YEAR ENDING MARCH 31, 1878.

Maintenance.	
To Maintenance and repair of impounding and service reservoirs, filtering-beds, works, and pipes, for obtaining and storing of water, including the cost of materials and labour . . . . .	£1,360 12 2
Maintenance and repair of mains, pipes, fittings, meters, and works connected with distribution of water, including the cost of materials, labour, and renewals . . . . .	3,834 2 4
Repairs of engines, &c., at the several works, included in Messrs. Harvey's accounts . . . . .	4,000 0 0
Pumping and engine charges, including the cost of coals, wages, &c. . . . .	9,970 9 5
Filtration, including the cost of materials and labour. Salaries of Engineer, Superintendent, and Clerks, and wages of Inspectors and Turncocks . . . . .	5,275 1 11
Rents . . . . .	16 6 0
Thames Conservancy . . . . .	500 0 0
Rates and taxes . . . . .	4,354 9 1
	£33,511 4 10
Management.	
Allowance to Directors . . . . .	£506 5 0
Allowance to Company's Auditors . . . . .	21 5 3
Salaries of Secretary, Accountant, and Office Clerks . . . . .	1,005 6 8
Superannuation . . . . .	200 0 0
Commission to Collectors . . . . .	1,784 15 5
Stationery, printing, and general establishment charges . . . . .	687 0 9
Law and parliamentary expenses . . . . .	268 11 0
Official Auditor and Water Examiner . . . . .	93 18 11
	4,567 3 0
Balance carried to next account, to provide for losses . . . . .	4,000 0 0
Dividend and interest account for transfer of profits . . . . .	39,402 2 7
	£81,480 10 5

Cr.—REVENUE ACCOUNT.

By Balance brought from last account . . . . .	£3,500 0 0
Surcharges on water-rental to 30th of September, 1877 . . . . .	2,428 7 1
	£5,928 7 1
Less allowances for empty houses . . . . .	£1,519 1 11
Ditto overcharges . . . . .	801 8 9
Ditto bad debts . . . . .	1,251 2 11
	3,571 13 7
Water-rents accrued to the date of this account . . . . .	£2,356 13 6
Rents received . . . . .	79,055 5 5
	68 11 6
	£81,480 10 5

The CHAIRMAN said: The first resolution is “That the report of the Directors be received and approved.” Before I ask you to confirm that resolution, I will make a few remarks, but I will not detain you at any length. At our last meeting, it was painful to your Directors to be in a position to offer you a dividend at the rate of only 2 per cent. To-day, however, the accounts show a much more favourable result, and they will, I feel certain, for some time, give you a fairly increased dividend. Your Directors are pleased to be in a position to recommend to you a dividend at the rate of 3 per cent., and to carry over to next year £4494 instead of £564 at our last meeting. This £4494, if divided, would enable your Directors to give you a dividend at the rate of 4 per cent. per annum. Your Directors have continued to effect reductions in the working expenses. I have a list of the reductions which I will give you afterwards. There is an increase to revenue from a revision of domestic rates, and of about £2000 in office rates. These office rates are the rates which we receive from parishes for road-watering, and also from railways—large amounts which we receive by cheque, and not by our collectors, and we pay no commission on them, and there is also a large increase from the extension of our district, for which purpose we have laid 5652 yards of new mains. Out of that quantity, about 3000 yards have been laid by our Contractors, Messrs. Aird, and the other 2570 yards have been laid by the Company's own men. We have also been making various alterations to existing mains, by which we have been enabled to give a more efficient supply, in reference to quantity and pressure. During the half year 1255 houses have been laid on, which are estimated to produce £1085 for half a year, or £2170 per annum. The alteration and reinstating of the filter-beds at Hampton and Battersea have made the quality of the water quite equal to any supply drawn from the Thames. This reconstruction of our filter-beds has deprived you of a large sum which otherwise would have



been applicable to dividend, but the end has now been successfully accomplished, so that after the close of the current half year such charges will disappear from the balance-sheet, leaving so much more revenue to be divided. A further saving has been effected in the consumption of coal during the half year of about £350, and your Directors have received tenders, and have entered into a contract with a responsible firm for two years supply, the effect of which, it is anticipated, will be to save revenue in future—about £800 a year. It is very satisfactory, as showing the growing confidence in the undertaking, that this half year £11,500 of the Company's mortgages at  $4\frac{1}{2}$  per cent., and some of them at  $4\frac{3}{4}$  per cent., have been replaced at 4 per cent. This makes for the year ended March 31, 1878, £34,500 replaced at 4 per cent. from  $4\frac{1}{2}$  and  $4\frac{3}{4}$  per cent. It is a matter of very great satisfaction to your Directors to be able to state that complaints from our customers at present are reduced almost to a minimum—complaints of non-supply of water or of its bad quality. As to the Bills promoted by the Metropolitan Board of Works, in reference to water supply, you will have gathered from the public Press that they have withdrawn them after very strong expressions against the measures by the public, as entailing on the ratepayers very seriously increased taxation. With regard to the Peckham reservoirs, your Engineer has been employed in testing their stability, and to enable us to judge what work will be necessary before filling them with water. Several of the Directors have been in the reservoirs with him, and we have had the advice of General Nicholson, of the Royal Engineers. The question of what is best to be done is still under his serious consideration. With these few observations I am now ready, on the part of the Board, to reply to questions upon any points which any Proprietor would like to have explained; but I should like, first of all, to read a few statistics to you, showing the economies which the Board have made. Last half year the law and parliamentary expenses were £1825. That chiefly arose, if you remember, from the negotiations in reference to the Battersea land. This half year they are £268 11s. This may appear a large sum, but I should like to give you the details of it. The general business of the Company has involved an expenditure of only £14, for we have really very little law going on now, because we have sufficient Directors who are able to advise as well as a lawyer. We have an action pending against our late Engineer, and that came to £120 for the half year. Then, as to Richmond, we had £2000 owing to us there, and it was suggested to us that if we applied to Richmond in a proper way, a good many people would give us a large portion of that £2000. We took Counsel's opinion, and the law bill was £42, and the counsel's fees £54, making £96 altogether. Police cases came to £30. That is to say, that in several cases where we had increased the rates and cut off the water because those rates were not paid, we were brought before the police courts, and we had to appear. I dare say that you all saw that there was a question of the Fire Brigade, and we had to oppose the Bill in Parliament, and this cost us £29. That made £280, and we received back from another Company, for whom we jointly opposed, £21, making your law bill £268. It used to be always £1000 every six months, so this shows an improvement.

A SHAREHOLDER: Did you not get anything from Richmond?

THE CHAIRMAN: We got enough water-rates from Richmond to pay the collectors we employed. This was worth trying for—we paid £96 to try and get back £2000. As to the filtration, last half year it was £8488, while this half year it is £5275. Next half year—in the current half year, from March last to September next—the extra cost of filtration will drop down to £2300, which we have already spent, and that is totally finished. We have also the usual cleaning of sand, which may be £800 to £1000; but the extra charges for filtration will be £2300. The main and iron pipe repairs last half year cost £644, and this half year £1173. The reason why there is an apparent increase of £528 is this: At Wandsworth our filtered main and unfiltered main run side by side, and there was a connection between these two pipes. The Wandsworth people declared that we gave them unfiltered water through the filtered pipe; but the pressure on the filtered water was twice the pressure on the unfiltered, so that was quite impossible. However, they said they would be satisfied with nothing but our doing away with the connection between the two, and that involved an expenditure of £150. Then there were two bursts. When we took off the superincumbent weight of earth, the pipes were found to be very thin, and they burst; that cost £60, and compensation to a man whose house we damaged amounted to £25. Then we discovered that we had, at Nine Elms, two pipes running through a man's property, on which he was going to build, and through which we had no parliamentary rights to go. He said, "You must take away your pipes." They happened to be 15-inch and 12-inch pipes. Our Engineer arranged that we should move the pipes out of the way of the buildings the man proposed to erect, and that he should give us a perpetual easement. That involved a cost altogether of £200. Then there was an alteration to a 27-inch main, going over an arm of the river at Nine Elms, and another alteration of a 20-inch at Vauxhall Cross. These two last alterations were for the purpose of giving us an increased pressure in our district. That will exactly account for the increase in what we call main and iron pipe repairs. The plumbing last half year was £102, this half year it is £20; meter repairs last half year came to £55, and this half year to £10. Street work cost last half year £1833, this half year £1512. The establishment charges last half year were £620, and this half year they are £60 increase, which is a very small sum. The increase was made up of £12 for maps, £38 to the Phoenix Fire Office for insurance (this item coming in once a year), £10 to Dr. Tidy for analyses, and the fitting up of a supervisor's office. The collectors commission last half year was £1648, and this half year it is £1784; damages this half year the same as last half year, £72; and rates and taxes this half year, £4354, against £4129 last half year. We have all been reassessed, and they have put us up a little, but I think we have got off very well. The Auditor's charges are the same as last half year; storage of water the same. Thames Conservancy £500 this half year, against £805 last half year—we pay more one half than another; superannuation this half year, £200, against £300 last half year. That is because we had an old collector, who was in our service some 30 years, and we gave him £100. The salaries in the Secretary's department show an increase of only £30, and we have taken on a junior clerk. The salaries in the Engineer's department are this half year £3700 against £2435, and, of course, you will want to know how this arises, so I may as well state it at once. The salaries of Engineer, Superintendent, and Clerks, and wages of Inspectors and Turncocks are what I have stated; but, instead of an increase, there is a decrease of £145. Our Turncocks used to have 26s.; but every other Water Company paid them 31s. We found that other Companies were increasing their works, and required Turncocks, and, unless we had advanced their wages to that paid by other Companies, we should have had them leaving us, and we should have had to take on other men in large numbers, and the district would have been badly supplied. It is only fair, too, to give them what they are worth, so we give them 31s., the same as other Companies. That involved an increased charge of £150. Then there were, in fact, no maps showing where the cocks in our district were, so we have taken on an extra draughtsman, and paid him £60. The deputy turncocks, in the late Engineer's time, were as many in number as the turncocks—25. Our late Engineer's plan was to charge all he could to revenue, and he used to put

the wages of the deputy-turncocks to capital; but, of course, when our accounts were overhauled it was seen they were a revenue charge, and that came to £1200. Therefore, you have a charge to revenue of £1410 to add to £2435. Engine and premises repairs last half year cost £1228, and now they are £1053; but do not imagine that that £1053 has been spent on engine repairs. We are bound to put it under a certain head by the Government Auditor, but the engine repairs, instead of being £1053, are nothing of the kind—they are really only about £106. We do everything ourselves now, and £106 was spent in buying castings. The amount of tradesmen's bills we have paid this half year for repairs of engines was only £70, as against £140 last half year. The remainder of the £1053 is made up of £976, which is in our weekly labour-sheet, but which we are bound to allocate as engine, &c., repairs by the Government Auditor. I am now ready to reply to any question.

MR. BADDELEY: Will you please explain the bad debts, £1251, in the No. 3 account?

MR. BRADFIELD observed that a few months ago the rates were raised in the Borough, which caused a good deal of bother. He wished to know whether at that time the whole of the rates were raised, or only those in the Borough district. Had the Company not raised the water-rates generally? He understood that, if the Company were to charge the maximum rate, the Shareholders would have 10 per cent. dividend. Parliament was very severe on them in some things, but said they might do certain things. To raise the rate was a difficult thing, but they could do it.

MR. BECKFORD said that the Company had not only raised their rates, but they had done it in what he would venture to say was a most improper way. No notice whatever was given of the increase of the rates, as if the customers deserved not the slightest notice or civility. He happened to be one of the Company's "unfortunate tenants," and one of their collectors called, leaving a paper, which, on examining and comparing with the previous one, he found showed an increase of some 15 or 20 per cent. Two or three years ago the same thing happened, so the last was No. 2. He did not know whether No. 3 was coming. The Company had nearly doubled his rates, and the same remark applied to every one else in his district. He thought if the money was wanted the thing might be done in a civil and proper manner. He thought a notice ought to be sent of any increase in the rates, and he suggested that if the Company increased them again notice should be given, and the reasons stated for the increase. Again, he thought hitherto their assessments had been haphazard, but he thought they should go on some principle. He might mention that the collector in his district came with the account. He was seldom at home, and the collector said he would call, or he (the speaker) might have the privilege of sending the account. He could only say that the collector would have to wait a very long time, and he thought the collector might say that he would call again on a certain day for it.

A SHAREHOLDER observed that that was the custom in the case of the New River Company.

MR. MANNING said the Chairman had referred to an action pending against the late Engineer, and as to that matter he wished to make a few observations. The late Secretary's superannuation was £300 a year. The Board, at the last meeting, stopped this superannuation during the trial of the action he had mentioned. It seemed to him rather hard that Mr. Robinson's allowance should be stopped during the action, and while there was doubt. In Criminal Courts the prisoner always had the benefit of the doubt. He wished to know whether this money was withheld from Mr. Robinson in perpetuity or only temporarily.

MR. STURGE wished to ask a question as to the superannuation allowances. His point was whether the Shareholders had the power to make any grant, except at the half-yearly or yearly meetings of the Company. The Shareholders were always fluctuating, and all of the Shareholders that day would not be Shareholders a year, or even six months hence, perhaps. The doubt in his mind was whether the Company had any right to make a grant for a longer period than a single year, and he thought, if they had not this right, the question of superannuations would soon be decided. He held that such charges must be an annual vote.

MR. LILEY said they had heard that day of charges being made against capital account which ought to have been made against revenue. He remembered that some time ago they had the same peculiar state of accounts before them. He wished to know whether, since the close of the accounts, anything further of the same kind had arisen. Were they on "sound ground" yet? As to the question of supply, they had heard that day the complaint of a customer; and he thought it was a good thing for them to hear what the feelings of their customers were, as well as to look at this question from their own point of view as Shareholders. The customer to whom he now referred had complained of want of civility. In any trading company that was a just cause of complaint, and they should do all they could to remedy the matter. At the same time, he thought there was not so much in this complaint as in the increased charge. He thought that the public should consider that this Company, and all Metropolitan Companies, had been called on to expend immense sums of money to improve their supply of water. This Company had spent a large sum of money in this way, for which they received no benefit in the shape of dividend. The expenditure had been simply to improve the supply, and, that being so, he thought they had a right to ask the consumers to pay the Company a better price for a better article. He thought there was just cause for asking their customers to pay, if not to the uttermost farthing, still considerably more than they had been in the habit of paying hitherto.

MR. BADDELEY was inclined to agree with much that had been said by one of the speakers as to incivility. He, however, had always found it best to pay at once any tax which he was called on to pay, and so prevent the collector, if he was inclined to be uncivil, from being uncivil at his doors. No collector of any kind ever called at his house a second time, for he always found it the "better part of valour" to send the money at once. He would now repeat his question as to the bad debts. There was a sum of £1251 in this half year's accounts, as against £700 last half year. This was a very serious item. The amount was not for bad debts composed of empty houses and overcharges, for these items, taken together, amounted to £3571. He was sure they were indebted to the Chairman for the very detailed account which he had given. With regard to the sixth paragraph in the report, referring to the tenders for coal having been obtained by advertisement, that advertisement struck him, when he saw it, as being very peculiar. Why a fee of 21s. should be exacted from every one who wished to tender for the supply of coal to the Company, he did not understand. The more tenders they had, the better; but the Directors restricted the number by a kind of tribute-money. He could only express his thanks to the Directors for the great attention they had given to the affairs of the Company during the past half year.

THE CHAIRMAN, in reply, said: Mr. Baddeley first asked us to explain why the bad debts are £1250 instead of £704, as last half year. Well, I may tell you that in "ancient days" the Chairman was dictator of the Company; but at the present time we are all equal, and any matter of dispute is put to the vote. My own private opinion is that we have not enough collectors. Other people, however, think that we have; but I do not think that our money is got in as rapidly as it would be if there were more collectors. There are nine collectors, and I believe we should save a consi-



derable amount of bad debts if we had more collectors, and collected our money more quickly. The matter, however, has been fairly discussed by the Board, and been put to the vote. We have an arrears collector. We get from new houses put on, a quarter in advance, without which we refuse to put a house on. The Secretary has just informed me that this half year's bad debts do not arise from what I thought, the inadequate number of collectors, but from Richmond. That did not strike me at the time. Personally, however, I entertain the belief that, if we had more collectors we should get our money in more certainly. Mr. Baddeley has asked a question as to tenders for coal, but I think he has almost answered that question himself. If we put tenders out publicly, we might have 200 tenders sent in. If a man is serious, he does not object to pay 21s., which is really a very small item on an amount of £12,000 or £14,000.

The ENGINEER (Mr. Thos. W. Rumble) observed that this was the usual charge, and he did not think it kept people from tendering. His experience extended for 30 years.

A SHAREHOLDER asked who took the money sent in with the tenders.

The CHAIRMAN: The Company. I guarantee that there is not a shilling misappropriated, to the best of our belief. Mr. Bradfield asked about the rates. We found the houses in our districts were rated by the "rule of thumb." A man looked at a house in "ancient days," and said: "We will rate him so and so. If he is a friend of mine, we will rate him low." What did the Directors do? They appointed a supervisor of the rates—a man who had lived in the neighbourhood 24 years, and was acquainted with every house in the district. He cannot re-rate every house at once, but in the Borough we found that there was great discrepancy. As to the question of raising our rates, I will read you an extract from the JOURNAL OF GAS LIGHTING, ETC. It says: "Lambeth is protesting against the increased rates levied by the Southwark and Vauxhall Company. There can be no doubt that, for some years past, the district has been under-assessed, and now that the Company are in what we may call low water, it is not unreasonable that they should endeavour to increase their revenue by all legal means. They are fully justified in the step they have taken. Of course it is disagreeable to have to pay increased charges; but such *désagréments* happen to people every day, and they are borne with composure, if not with satisfaction." As to the Borough, there are large hop warehouses there, one building is rated at £1800 a year, and we charge the person to whom it belongs £3 or £4. He said the water was simply for his men to wash their hands with. If they were under the Metropolitan Board of Works, every proprietor of a warehouse would be called on to pay 3d. in the pound, as what they call the public rate for watering the roads and the water for extinguishing fires; 3d. in the pound upon £1800 is £22 10s. We had a complaint to-day from a warehouseman, saying that we had put him up from 5d. or 6d. to 10d. If he was under the Metropolitan Board of Works, he would certainly have to pay the public rate of 3d. in the pound, and I believe a part of the domestic rate of 9d. We were asked by the same Shareholder why we did not send out a notice as to increasing the rates. I can only tell him that I am supplied by this Company; and when they told me that they were going to call on me for so much money, I said, "I shall not only refuse to pay it myself, unless you give me notice, but I shall advise every one else to do the same." That gives you what my idea on the matter is—of what is due to our customers; but since then the Board have passed a resolution that notice of increase shall be given to all customers. As to the suggestion that notice should be left when the collector will call, that is done nearly always; but our collectors have been very much pressed, and I suppose in certain districts the collectors have forgotten to do it. In my district the collector says that he will call on such a day. We will inquire into this matter, and the collectors shall have orders to say when they will call. Mr. Manning has asked a question about Mr. Robinson's salary. I believe that Mr. Sturge has given notice that he will bring forward a motion which will dispose of that question. Mr. Sturge asks to whom £200 superannuation is given. There is £50 given for the half year to a collector who was in our service 38 or 40 years, to whom we allow £100 a year, and the other £150 is six months of Mr. Robinson's superannuation, which remains as a liability to us till the Shareholders decide what to do in this matter. As to Mr. Hsley's remarks, the accounts have been sifted by the Government Auditor, Mr. Stoneham, by his deputy, Mr. Vaughan, and by the Directors, and we feel convinced that there is no single liability whatever in any shape—in the Engineer's, Secretary's, or any other department—which will come against the revenues of the Company.

Mr. STURGE wished to call the attention of the Shareholders to the circumstances of the £200 for superannuation. He understood that £50 was for a half year's superannuation to an old collector. He did not ask that this grant should be rescinded, but he wished to bring before the Shareholders, and the Directors especially, the question whether, if that grant was to be continued, it ought not to be regularly moved year by year, and not be considered something in perpetuity, as the Shareholders and the parties interested in the Company were always varying. He therefore thought that it was very doubtful whether it was legal for them to grant annuities in perpetuity. It would be open to any gentleman who pleased to move this £50 to the old collector; but his main object in rising was in connection with their late Secretary. It was very well known to several gentlemen that two or three years ago, when Mr. Robinson retired, the question of a grant to him—which he (Mr. Sturge) contended could only be an annual grant—was mooted at their meeting, and after a great deal of discussion it was fixed that £300 a year should be paid him. After that, when they met on another occasion, they found that the Directors had discovered that there were certain culpable irregularities connected with their late Secretary, and such irregularities that decided them that it was proper to suspend his allowance; and when the subject was mentioned to the Shareholders, they assented to what the Directors had done, leaving all the responsibility with them. Well, now he thought that the time had come when the Shareholders should consider whether they ought not, as Shareholders, to move a resolution, which he was prepared to do, rescinding the grant to their late Secretary, in consequence of which no further payment should be made to him. He did this the more readily because he happened to hold in his pocket an account of 100 guineas paid to his son while the latter was attending a day school. The boy was called a clerk in the office; and he understood that he spent little of his time in the office excepting on those days when the Directors and Shareholders were likely to see him—diligently attending school at other times. Under these circumstances, he thought it was altogether culpable on the part of his father to allow his boy to receive, between June 20, 1873, and Feb. 4, 1875, the sum of £105, being a series of quarterly payments. Under all these circumstances, he thought they would be quite justified, first of all, in passing a resolution giving him nothing further, and requesting the Directors to take the necessary steps to get the £105, improperly paid to his son, refunded.

Mr. LESLEY thought that, as there was a question of law involved in this, it ought to be settled. If it was contended that they had only the right at such meetings as this to pass a resolution referring to the ensuing half year or previous periods, and not in perpetuity, such a resolution as Mr. Sturge had put before them would not be required.

Alderman KNIGHT, a director, said the Board would listen to no one more readily than to Mr. Sturge, who was a large Shareholder, and who

brought matured judgment and sound discretion to anything he proposed. He was not aware that Mr. Sturge was going to bring forward this motion, or else, if he had had the opportunity to advise him, he would have said it required a little more consideration, and was not a matter which could be done in a hurry. If they were to do a thing of this sort, they had better err on the side of consideration and mercy. He suggested the advisability of Mr. Sturge consulting with the Chairman and Solicitor of the Company, and letting his resolution appear as a notice of motion for their next meeting. Their late Secretary had many friends among the Shareholders, and he suggested that no one should have the chance of saying, "I did not know that this resolution was going to be brought forward, or else I should have been here to defend my friend." He was much inclined to Mr. Sturge's view that such sums of money could only be voted for the coming or for the past year, so as not to bind future Shareholders. He urged that Mr. Sturge should not only be strictly right, but also strictly kind and considerate to Mr. Robinson, and that he should put himself in communication with the Secretary, who would put himself in communication with the Solicitor, and then, if so advised, he could give notice of motion for their next meeting, and so let every Shareholder know of it. He himself had never seen Mr. Robinson in his life, but he knew, through the Chairman, the circumstances to which Mr. Sturge had referred, and he (Alderman Knight) then said that Mr. Robinson had no right to any more of the Company's money.

Mr. STURGE acquiesced in the suggestion, observing that if all the circumstances had been known he felt positively certain that nothing would have been granted as a retiring pension to the late Secretary. With regard to the £200 for superannuation, he could not see why, if it was not paid, it had got into the accounts. He thought it really belonged to a suspense account.

The CHAIRMAN said they were bound to put into the accounts every liability that they knew of, and which they might be called on to pay. They, therefore, put it in the accounts as a liability.

Mr. STURGE: If you had made a note, "Claim not allowed," I should have been satisfied.

The CHAIRMAN: Well, the money is not paid.

Mr. BADDELEY asked whether the Secretary's allowance was not stopped at the last meeting, and what stage the action against Mr. Quick had reached.

The CHAIRMAN said Mr. Robinson's allowance was stopped temporarily at their last meeting. They did not know when the action referred to would come on. Interrogatories were issued; they had to reply, and therefore they could state no certain time when the action would come on, but they were going on with it. There was no action against Mr. Robinson.

Mr. STURGE having made a few further observations relative to his notice of motion, said they might, in the course of the communications between the Secretary, the Directors, and their Solicitor, get the point settled, which he thought of great importance, whether they could grant annuities in perpetuity, or whether any grant ought to be an annual grant.

The resolution of Mr. Sturge was then varied in accordance with the suggestion of Alderman Knight, and made a notice of motion for next meeting.

In reply to Mr. Manning, who said the reason given on a former occasion for withholding Mr. Robinson's allowance was till the action pending against Mr. Quick had been decided, no reference being made to his son's salary,

The CHAIRMAN said that the circumstances had come to the knowledge of the Directors since the pension was granted to Mr. Robinson. They had nothing to conceal, but the representatives of the Press were present, and they did not wish to make everything in relation to this matter public, but if any Shareholder desired to see why the Directors had altered their opinion since the grant was made to Mr. Robinson, he would be happy to show him the proofs on which they went.

Mr. COOPER asked how many years the charge for deputy turncocks was made against capital instead of revenue.

The CHAIRMAN said he did not believe the accounts of the Company had been kept in the order in which they should have been for very many years. In order to give the Shareholders big dividends, everything that could be put to capital, justly or unjustly, was put to capital. The deputy-turncocks were the people who did the ground work, and because they did the ground work, and cost £1200, and the turncocks did turn the cocks, also costing about £1200, the turncocks were charged £1200 to revenue, and £1200 for the ground work men was charged to capital. Of course, when the Government Auditor came to look into the matter, he said that the latter was a revenue charge, and must be charged to revenue accordingly.

Alderman KNIGHT said Mr. Baddeley had very properly referred to the large amount of what appeared to be bad debts—£1200. He should not have said anything on this matter had not the Chairman said that this was owing to their having too small a number of collectors. In his (the speaker's) capacity as a member of the Commissioners of Sewers, he presided over a Committee to inquire into the capacities of collectors. They found that, as to the poor-rates, many collectors collected from 4000 to 7000 houses, whereas none of the Company's collectors had more than 1200 houses. These bad debts were not attributable to a want of collectors; but where an old collector retired, and they could with advantage give a portion of his district to some other, so as not to increase the total expenses, they had done so, and they had come to this conclusion, in order to meet to some extent the views of the minority of the Board, who thought they should have more collectors. The bad debts were really less than last half year's, although they stood at £1200. This, however, was, as he had said, not due to want of collectors, but because £600 odd was from Richmond. The bad debts were really about £100 less last half year. As to the 21s. paid with regard to the coal tenders, a remark was made, or a fear expressed that this was a perquisite going into the pockets of some one. The Board, however, had set their faces sternly against perquisites. They insisted on having everything reported to them, and they did not allow any officer to do anything on his own account. Every penny now went into the hands of the Company. As to the complaint of want of civility, this matter was carefully gone into by a Committee of the Board, and they then said that every one who had his water-rate increased should have given to him the particulars on which the increase was based. If a man came to the Board they did not lay down a hard-and-fast line, but they said that, while representing the interests of their Shareholders, if he could show them that he was really using scarcely any water at all in a large warehouse, where they might make a considerable charge, they would make every allowance, and he did not know where they had not come by this means to some satisfactory conclusion. They were not there to drive a hard-and-fast bargain with the public—they were there as a trading community to make a fair profit for their Shareholders, and wherever they felt that they ought to depart from the parliamentary basis they were ready to do so.

Mr. C. M. VIALLS, a director, then formally moved the following resolution:—"That the report of the Directors, this day read, be approved and confirmed, and the recommendations therein contained adopted."

Alderman FINNIS, a director, said that he seconded the motion with



very great pleasure, as from what he knew of the Company at the present time, and, in the time of the former Board, their affairs were conducted as business matters ought to be. There was no such thing, when he came, as Committees of their various departments, but now there were such Committees. From what he had seen of the working of the Board in the past twelve months, he was convinced that they would be able to show a most satisfactory account in two or three years time.

The motion was carried unanimously.

Mr. MANNING moved, and Mr. WHITE seconded, the next resolution—"That the following dividends be declared, payable on and after July 15, 1878, at the rate of 3 per cent. per annum on the ordinary stock and class D shares, and 5 per cent. per annum on the preference stock and the preference shares."

The motion was carried unanimously.

The CHAIRMAN: The meeting is now made special. We are authorized to issue £432,000 of mortgages and debentures. We have already turned £400,000 of terminable debentures into debenture stock at 4 per cent., and now we ask your authority to turn the remaining £32,000 of terminable debentures or mortgages into 4 per cent. debenture stock.

Mr. LISLEY moved—"That debenture stock bearing a perpetual preferential interest not exceeding £4 10s. per cent. per annum, be and is hereby created to the amount of £32,000, for the purpose of paying off mortgages or bonds of the Company to a like amount, and that all such debenture stock shall rank *pari passu*." The resolution further empowered the Directors to issue it at such times, to such persons, and on such terms and conditions as they might think fit.

The CHAIRMAN, in reply to a question, said they were going to change  $4\frac{1}{2}$  per cent. into 4. They had put out £10,000 at 4 per cent., at a premium of three-quarters per cent. The premium went to the reduction of capital.

Mr. STURGE asked if the Directors expected to get this money at 4 per cent., because he observed in the resolution that it was not to exceed  $4\frac{1}{2}$  per cent. He was inclined to think that the resolution should state not to exceed 4 per cent., and thought that the credit of the Company was likely to be damaged if they offered  $4\frac{1}{2}$  per cent. for what other Companies got for 4 per cent.

The CHAIRMAN said that  $4\frac{1}{2}$  per cent. was fixed some years ago, when money was not so cheap as it was now. They were now, however, getting it out at 4 per cent., and less. He saw no objection to making the alteration suggested in the resolution. It was only a question of £32,000. He was quite sure that if they wished to put it out within a fortnight they could get it changed. They could only do this, however, as the mortgages became due.

A SHAREHOLDER inquired who had the transfer fees.

The CHAIRMAN, in reply, said they went to the Secretary.

Mr. JELLEY said the Secretary had the transfer fees, the fees being 2s. 6d. instead of 5s., as formerly, and the amount was about £30 a year.

Alderman KNIGHT said he had not known this before.

Mr. BADDELEY thought no gentleman connected with the Company ought to receive anything unless the money appeared in the accounts. He was the Auditor of a Company where the Secretary had the fees, but the fees were received and placed on one side of the accounts, and a cheque was given to the Secretary for the amount. He thought a resolution should be passed to that effect.

Alderman KNIGHT intimated that he would move such a resolution at the Board.

The CHAIRMAN pointed out that their late Secretary had £1400 a year, and attended at the office on an average two days and a half a week, stopping two or three hours, whereas their present Secretary, since the departure of Mr. Robinson, worked ordinarily for the first year and a half from nine in the morning till six at night, sometimes till ten and eleven o'clock. At the present time, all the officials came at half-past nine in the morning, and stopped till half-past five, office hours generally being from ten to four.

Mr. BADDELEY seconded the resolution, and it was carried unanimously.

Mr. LISLEY moved a resolution according the best thanks of the meeting to the Chairman and Directors, for their services during the past six months. He was sure that the resolution needed no comment from him, particularly after the somewhat lengthy time they had been discussing their affairs.

The motion having been seconded,

The CHAIRMAN, in reply, said: We are all very much obliged to you, and the much smaller attendance this time than last evidently shows that the Shareholders feel pretty confident their affairs are going on right. I am bound to tell you that it is owing in very great measure to the labours of our employees that we are able to increase the dividends.

The proceedings then terminated.

#### THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Beyond the fact that the Whitsuntide holidays have during the past week put a stop to every description of business, there is little or nothing to report. On the Manchester Exchange, a close holiday has been observed since Tuesday, many of the places of business have been closed for nearly the whole week. The majority of the collieries in the Manchester district have been stopped for four or five days, and in some cases for the entire week, as not only are heavy stocks held, but it has been next to impossible to move coal either by rail or canal, as the Railway Companies have required their lines to be kept clear for the extra holiday passenger traffic, and the canals have been closed for repairs.

In other Lancashire districts, where the holidays are not so generally observed as in Manchester, there has also been very little work doing; and with regard to the iron-works, these have been closed in most cases for the greater part of the week.

So far as the very limited amount of business that has been doing in either the coal or iron trades is concerned, this can scarcely be taken as any guide to the real condition of the market, and prices nominally are the same as last week. There is, however, still an evident weakness in the price of coal, and so long as the market is overstocked, and there are so many needy holders pushing for sales, consumers naturally are able to buy on pretty much their own terms. With regard to iron, there is no material change, so far as local brands are concerned, as Lancashire makers are already losing money, and are not prepared to go lower, although they are still undersold by iron offering from other districts.

#### THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The shipments of gas coal from the Tyne Dock still keep up to a full average. Of course, the principal demand is for the best qualities. The leading gas coal pits are tolerably well contracted over the year, and work well up to full time. Second-class collieries fall very short of that; half time is rarely exceeded. The price of gas coals in the open market is about 7s. best, and 6s. seconds, net. The same observation applies to

steam coals. Most of the best collieries in this trade do pretty well, but second-class pits hardly come up to half time, and prices are very irregular. There is no local demand for coals. As a rule, small and manufacturing coals are a drug. Small coals in any quantities can be delivered aboard ship at from 2s. 6d. to 3s. 3d. per ton.

The coasting coal trade is flat and dull. About 4s. 6d. per ton, and in some instances less than that, is paid steamers to carry coals to London. The rate for small sailing ships, to discharge gas coals at the wharves below London Bridge, does not exceed 5s. 3d. per ton. In some instances sailing brigs have been fixed at 1½d. per ton less. There is very little business doing to the Dutch or French ports, and freights are equally low. Rates are down about £1 per keel to Cronstadt; they now stand at £8, and there is a fall of freights to the Mediterranean. Generally speaking, therefore, the whole course of the freighting trade at present favours shippers. There is little speculation anywhere, except in the direction of companies or merchants picking up lots of coals at a bargain.

With regard to the manufacturing trade of the Tyne and North of England generally, the more settled appearance of the Eastern Question with the not very remote prospect of peace, tends to improve its tone. The measure of its prosperity may be indicated by the quotations in the chemical market, which show a rise of something like 1 per cent. There is more disposition, too, on the part of foreigners, to import north country pig iron at the present rates. The fire-clay goods trades, with the cement business, do not look so depressed either, though there may be no material alteration in prices. It is not expected that there will be a resumption of active business until the close of the Conference.

#### TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

On Thursday last a meeting of the Perth Corporation Gas Commissioners was held, when the subject of the estimates of income and expenditure for the ensuing year were under consideration. In moving the adoption of the estimates, Treasurer M'Kenzie said that they had not now so large a surplus as at this period last year, which was chiefly to be accounted for from the fact that the estimates were exceeded by £400. The expenditure of the current year, however, would not be nearly so large, and he thought that, with care and economy, they would manage to furnish the community for another twelvemonth with gas at 4s. 2d. per 1000 cubic feet. The motion was seconded and agreed to. At the same meeting, notice was taken of the recent death of Mr. James Morrison, who had acted for many years as Auditor to the Gas Commission. That gentleman had rendered very valuable service to avoid a parliamentary contest at the time the gas-works were being acquired on behalf of the public, and his efforts in that respect were completely successful. On the motion of the Treasurer, seconded by the Lord Provost, a resolution was passed, and recorded in the minutes, expressing the Commissioners' sense of the services which Mr. Morrison had rendered, and regret at the loss which they had sustained.

The Municipal Authorities of Edinburgh, in view of certain alterations being made in their famous Princes Street, recently expressed a desire that a subway might be made for containing the gas and water pipes, and in order that the repairs required on the same, from time to time, might be executed with as little inconvenience as possible. A conference was held on the subject during the past week, which was attended by representatives of the Town Council, the Water Trust, the Gas Companies, and the Road Trust. It was stated that such a subway as was contemplated would cost from £7000 to £8000. A good deal of discussion took place, in the course of which Mr. John Reid, of the Edinburgh and Leith Gas Company, stated that subways had been proved to be very dangerous, and recommended that the Authorities of towns where such tunnels had been tried be communicated with before any resolution was passed. The conference broke up without the proposal to construct a subway being agreed upon.

An extraordinary general meeting of the Peterhead Gas Company was held on Wednesday, to consider and, if approved, to pass a number of resolutions relative to the transference of the gas management from the Company to the Corporation of the town, in terms of a resolution of the Town Council to that effect carried in the autumn of last year. There was a good attendance, and the following resolutions were put to the meeting:—"1. That the business hitherto carried on by the Company, and all the rights, powers, and privileges, and all the lands, premises, works, plant, stock, and whole other property of the Company, be sold and transferred to the Town Council of the Burgh of Peterhead, in terms of resolution by the Council to that effect under the Burghs Gas Supply (Scotland) Act 1876, and that at mutual valuation—the payment of the purchase price to be either by a capital sum of money or annuities, or partly a capital sum of money and partly annuities, as may be agreed on with the Council. 2. That a party or parties be appointed with all the powers necessary to arrange and conduct said sale and transfer, and to grant, execute, and deliver whatever writs may be necessary to transfer the moveable property of the Company to the said Town Council. 3. That the Trustees to whom the heritable subjects of the Company are vested be authorized to grant, execute, and deliver the necessary conveyance thereof to the Town Council." These resolutions, after deliberation, were unanimously carried, and at a meeting of the Town Council, to be held at an early date, they will be submitted for the consideration of that body.

The annual meeting of the Galston Gas Company was held last Tuesday, when a statement was submitted which showed that the affairs of the Company were in a prosperous condition. A dividend of  $7\frac{1}{2}$  per cent. was declared on the capital stock.

At the annual general meeting of the Blairgowrie Gas Company, on the 13th inst., it was resolved, on the recommendation of the Directors, to declare a dividend of 6 per cent., being the same as for several years past. In accordance with another recommendation by the Directors, it was agreed to call a special meeting of the Shareholders to consider the propriety of issuing new stock for the amount of the debt incurred by the improvements and alterations of previous years, instead of paying interest yearly upon the same.

The annual meeting of the Shareholders of the Kinross and Milnathort Gas Company was held last Wednesday—Mr. R. B. Begg, Chairman of the Company, presiding. From a statement submitted by the Directors, it appeared that the affairs of the Company were in a highly satisfactory state, and it was agreed to declare a dividend of 5 per cent., to reduce the price of gas, to hand over a considerable sum for the reduction of the debt, and to make an addition to the salary of Mr. Page, the Manager of the works.

The Dunoon Gas Company, at the annual general meeting, held on the 8th inst., resolved to declare a dividend of 10 per cent., and to reduce the price of gas 5d. per 1000 cubic feet—from 6s. 3d. to 5s. 10d.

A dividend of 5 per cent. was declared at the annual general meeting of the Stonehouse Gas Company on Wednesday last. It was reported that the debt due by the Company was now £500, and that the amount of shares held by the Shareholders was 1117 shares of £1 per share, fully paid up.

At last Thursday's meeting of the Town Council of Hamilton, it was agreed that, in consequence of the burgh extension, and additional gas



supply required for the district included, new purifiers and exhausters should be provided during the summer months, and that the Gas Committee should at once take estimates for the same, with power to accept and close should they be found satisfactory.

Dr. Wallace's report on the illuminating power of Glasgow gas during the week ending the 8th of June shows that in no instance was the minimum below 26.06 standard candles, while the average ranged from 26.77 candles to 27.43 candles, and the maximum from 27.17 candles to 29.11 candles. The report does not give any results for the western district.

At the meeting of the Town Council of Edinburgh last Tuesday, there were submitted reports of analyses of the gas supplied to Edinburgh, which the city analyst had made on two occasions in the previous month. They showed that on the first both Companies' gases were equal to 27.8 standard candles, and on the second the Edinburgh Company's gas was equal to 28.70 candles, and that of the Leith Company to 27.20 candles.

The Bridgend Water Company's works have been sold to the Perth Corporation Water Commissioners for the sum of £1428 18s.

The Glasgow pig iron warrant market was somewhat dull during the greater part of last week, but a large amount of business was done at lower prices. The final prices on Friday were 2d. under those of the previous Friday.

A marked degree of dulness still characterizes the Glasgow coal market, orders being scarce, and prices low and unprofitable.

**DEATH OF MR. JOHN ROFE.**—We were unaware of the fact, until we met with an obituary notice in the *Geological Magazine*, that this estimable gentleman, well known, in years gone by, to Gas Engineers and Managers, died on the 11th of April last. From failing health, Mr. Rofe had long retired from connection with gas-works, and devoted himself to his favourite geological studies. He was born in London in 1801, and as he grew up, studied engineering under his father, Mr. J. Rofe, C.E., with whom, in partnership, he subsequently carried out some important undertakings in gas and water works. "On several occasions," says our contemporary, "he gave valuable evidence in Parliamentary Committees, with reference to towns water-works and gas companies Bills, in which his sound geological knowledge proved of great service to him. In 1827 he settled at Preston as Engineer to the gas-works, a post which he held for 25 years."

**HARTLEPOOL GAS AND WATER COMPANY.**—A meeting of the Shareholders in this Company was held on the 13th inst.—Mr. T. R. Holmes in the chair—when it was resolved—"That 6816 new shares of £10 each be issued under the provisions of the Company's Act of this session; that 4816 of such new shares, representing the water capital of the Company, be allotted to the present Shareholders in the proportion of about one new share for every eight shares now held by each Shareholder, and that the remaining 2000 new shares, representing the gas capital of the Company, be sold by public auction, in accordance with the 9th section of the said Act, at such times and in such manner as the Directors may hereafter determine, and as the necessities of the Company require." It was also resolved—"That the first call on such new allotted shares be £2 per share, and be payable on or before the 1st day of August next; and that the amount of all subsequent calls on such allotted shares be made at such times as the Directors may from time to time determine."

**CAST AND WROUGHT IRON WATER PIPING.**—The *Hessen Gewerbeblatt* remarks that it is well known that iron rich in carbon is less subject to oxidation than iron poor in carbon. Wrought iron, therefore, exposed to influences which promote oxidation, rusts more rapidly than cast iron. The very simple experiment of laying samples of both sorts in damp earth, and leaving them there for a sufficient time, will show the difference in their rates of rusting. The duration of wrought piping when laid is thus likely to be less than that of cast piping, and this is proved to be the fact in practice. Commonly speaking, the temperatures of water running through piping in use is lower than that of surrounding bodies, and the walls of the tube are constantly condensing moisture, which powerfully promotes rusting. In houses, or in masonry conduits, where the pipes can be got at and kept protected, by tarring, painting, or otherwise, from rust, wrought-iron tubing can be used with advantage; but in earth it is otherwise. An experienced engineer, who has often had to lay wrought-iron piping in short lengths below ground, has always found them, before long, more or less destroyed.—*Iron*.

**A NEW ADVERTISING DODGE.**—A contemporary remarks that economy in American cities with their gas lighting arrangements seems to be the order of the day since Chicago has taken steps in that direction. Pittsburgh has followed, but in an entirely novel manner. It is proposed to erect three lighthouses that shall throw "such a flood of light that anywhere in Pittsburgh or Alleghany a pin could be seen if lying on the pavement in the darkest night." The lights are to be so located that a perfect crossing of the beams will be effected, thus neutralizing the shadows. The promoter of the idea intends, if acceptable, to raise capitalists who will build and equip lighthouses and run them 17 years without cost to the city. What is required of the city amounts to this: All the lamp-posts are to be handed over for the use of the Company, to be fitted up as advertising mediums by means of revolving caskets, and the income to be derived therefrom to go into the pockets of speculators. At the termination of the 17 years, the city, on payment of original costs, takes over the whole apparatus.

**GAS COMPANIES ACCOUNTS.**—Mr. C. Crowther Smith, the Secretary of the Southampton Gas Company, has prepared a set of half-yearly accounts, based on the form adopted by the Board of Trade. These accounts, which primarily were intended for the use of his own Company, are, *mutatis mutandis*, applicable in every case, and, as presenting in a minute and comprehensive manner a general view of the financial condition of an undertaking, seem to leave nothing to be desired. The account forms are printed on very large sheets, and in the specimen before us are made up into a volume of some 48 pages, strongly bound and lettered. The first ten pages are occupied with the statements of capital, revenue, profit and loss, &c., &c., in the prescribed form, with the added line of "Premiums on Sale of Shares by Public Auction," in the statements B and C. The five following pages are devoted to "Capital Expenditure and Receipts during the Half Year," in detail, with some added particulars. Page 16 is utilized for an account of "Coals Carbonized or Used, and Average Cost of Coals during the Half Year." Pages 17 to 26, inclusive, are headed "Analysis of Expenditure on Revenue Account." Page 27, "Summary of Gas and Meter Rentals;" pages 28 to 33, "Residual Products, Rents, and other Items;" page 34, "Interest on Temporary Loans, and Interest on Money Deposited;" page 35, "Interest on Amount Invested;" page 36, "Unpaid Dividends and Cheques;" pages 37 to 39, "Sundry Tradesmen and Others, for Amounts Due for Coals, Stores, &c." The remaining pages are to be used for account of "Stocks on Hand," "Gas and Meter Rentals Due," "Consumers Deposits," "Coke and other Residuals," and "Sundry Accounts Owing, as per Ledger." Mr. Crowther Smith has bestowed a large amount of care and attention in compiling these forms of account, and they are printed and ruled up in a very superior manner.

## Register of New Patents.

4381.—O'NEILL, A., Baltimore, U.S.A., "Improvements in modes of constructing and laying mains and service-pipes for water, gas, and other similar purposes." Patent dated Nov. 11, 1876.

These improved pressure-pipes are constructed with a chilled convex spigot end, with a fillet, on which are formed connecting lugs with convex faces fitting corresponding concave faces, lugs, or flanges, in the bell end of the next section, the curvature of the working faces of the lugs affording play to the joint. The bell end is constructed with an annular seat for the reception of a gasket of lead, soft rubber, or other compressible material, which is formed on either face with a feather edge, or annular lip, to adapt it to be more readily compressed to fit the seat in the bell and the pipe end which presses it on to the seat. The gasket is also formed with radial lugs, fitting in corresponding notches in the bell, to prevent its rotation as the spigot end of the pipe is twisted into position. The bell is also formed with an internal flange and annular recess, to adapt it for the reception and packing of a cut or a common pipe, the end of which may be of plain cylindrical form, and not furnished with the peculiar coupling lugs. The shoulder of the bell is formed with radial flanges for the reception of a twisting jact, or of a jenny, by which the last section is held while the new one is twisted in position. The inclined shape necessary to give the action of a screw to the coupling lugs may be made on the lugs of the spigot end, or the flanges of the bell end, or both. A suitable stop is provided to limit the turning of the spigot end within the bell. A dead end, with coupling devices similar to those on the spigot end of the pipe, is provided to close a terminal section.

The invention further consists in the provision of a ferrule with a tapering spigot end, surrounded by a thimble of soft material to form a service connection by driving the thimble into an opening which may be drilled in the main-pipe.

The invention further consists in providing a T, or intersection, with a gasket seat and flanges analogous to those of the pipe bell, for the reception of an annular cap, or a service T, or a plain service-pipe.

The invention further consists in the peculiar construction of a cap to close the outlet, and to either hold a tight gasket or to receive a pipe, which may be screwed into the annular cap at will.

4459.—GENT, P., Congleton, "Improvements in and appertaining to gas stoves." Patent dated Nov. 18, 1876.

The first portion of this invention consists in a novel method of applying water inside a close bell-shaped or pillar gas-stove. The water being heated by the gas-burner gives off a moisture which vaporises throughout the stove, and acts as an absorbent or condenser of the odours and impurities usually generated by such gas-stoves. The second portion consists in applying a wire gauze or perforated metal guard round the burners of gas-stoves, so as to prevent the flame from being affected by sudden draughts of air. The third portion consists in applying a reflector of silvered metal, glass, or other suitable material underneath the burners of gas-stoves constructed according to this invention.

4563.—VANDER KELEN, L., Brussels, "Improvements in gas-stoves." Patent dated Nov. 25, 1876.

This stove consists of a cylindrical external casing slightly tapering towards the upper part, which encloses an inner cylinder of an inverted conical form, the lower part sloping down rapidly so as to form a suitable surface for the gas-flame to impinge upon. The upper part of the inner cylinder terminates in a flange, which enters a hollow rim below the cover of the stove, and contains sand for the purpose of sealing the joint. The lower part of the inner cylinder terminates in a tube, which is carried away under the floor, and may be used for conveying heated air to another apartment or for introducing fresh air from without.

The burner which forms the heater is, by preference, of a double concentric form and the gas is conveyed thereto by duplicate pipes, so that one or both burners may be used according to the heat required. A certain proportion of air is allowed to flow in with the gas, so as to obtain the maximum of heat therefrom.

Between the inner and outer cylinders there is arranged a spiral screw or inclined plane, the object of which is to absorb all the heat from the gas, and impart it to the external casing. At the upper part of the outer casing is a lateral outlet, which carries away all injurious products of combustion. A door is fitted in front of the stove, so as to afford ready means of lighting the burners.

4576.—MATHIESON, C. F., Mincing Lane, London, "Improvements in the manufacture of gas." Patent dated Nov. 25, 1876.

This invention has for its object improvements in the manufacture of illuminating coal gas, and in carrying it into effect the fire-clay retorts are placed horizontally one over another, and so closely that they are in direct contact at the mouth, and the narrow space of about one inch between the respective bodies of the retorts is filled up with a layer of fire-bricks  $\frac{1}{4}$  inches wide. The lowest retort is coupled with the middle retort, at the mouth outside the bench, by a cast-iron circular tube about 6 inches long, and of an internal diameter of at least 8 inches. The middle retort is coupled with the upper retort, within the bench at the back, by a round hole in each of about 15 inches diameter, and to correspond or match exactly, and joined by thin fire-bricks properly cemented with fire-clay to render the connection gas-tight. The outlet is from the mouth of the uppermost retort, and formed of cast iron of an internal diameter of at least 10 inches. Within and on the bottom of this uppermost retort, at the edge of the round hole, is formed a short and level fire-clay wall, of a height sufficient to prevent the coal encroaching on the rear passage from the middle retort.

In charging the retorts, a half cylinder scoop is provided, with a steel bar of about  $\frac{3}{16}$ ths of an inch thickness, rivetted across the open end to connect both sides, and rising from each side in a convex line about 2 inches, but quite level in the central part. When the labourers have turned the scoop, the charge of coal is deposited in the retort in a long ridge of irregular elevation; they have then to carefully withdraw the scoop over that ridge, and when about half the length is outside, the handle end should be depressed until the scoop is entirely withdrawn. This bar spreads and levels the discharge of coal evenly over the bottom of the retort, and the timely depression of the handle end of the scoop prevents the removal to the mouth of the retort of any large pieces of coal there may be in the charge.

The thickness of the charged layer of coal, in retorts of about 8 feet 6 inches to 9 feet length by 16 inches and 20 inches internal diameter,  $\square$  shape, should not exceed 5 inches, in order to admit of perfect distillation of the charge, and with such a charge the distillation is completed in about two-thirds of the usual time now employed. By the observance of this arrangement the product of good gas in each bench during 24 hours is immensely increased (more than three charges being added), and much fuel saved, while one-third of the retort benches and apparatus is dispensed with, besides the proportionate labourage and renewal of retorts and apparatus.

The production of pure gas and its free passage are also much facilitated.



tated. During the distillation the use of an adequate exhaustor is indispensable, and the dip-pipe should be adjusted at about half an inch dip into the hydraulic main, which ought to be at least 3 feet from the top of the retort-bench.

The operation of charging the retorts begins at the uppermost, continuing with the middle, and terminating with the lowest in rapid succession; and one set in the bench having been charged, the second set of retorts is treated in the same manner after an interval of about one hour and a half. The result of this interval is a better mixture of all the gas, and an equal temperature of the retorts. If the retort-bench contains seven retorts, the charging of the seventh is performed immediately after that of one set of three.

In order to secure the collective advantages from the enumerated improvements, it is necessary to observe the following rules, invariably practised by well-organized gas-works:—The careful maintenance of an equal temperature during distillation by a small supply of fuel every 15 minutes; the cleaning of the apparatus once each month; and the avoidance of the use of coals which are very moist or in too large pieces.

4613.—YOUNG, W., Clippens, N.B., "*Improvements in the manufacture of illuminating gas.*" Provisional protection only obtained. Dated Nov. 29, 1876.

This invention relates to improvements in the manufacture of illuminating gas, and consists—first, in producing or inducing the decomposition or destructive distillation of the coal, shale, hydrocarbon oil, or other substance used for the production of gas, by causing a rapid agitation or circulation of the volatile products inside the retort or other distilling or decomposing vessel, either by means of mechanical pistons, or by the agency of jets of compressed gas, steam, or vapour, with the object of bringing about a more regular and equal decomposition, into permanent gas, of the elements of the coal or other substance, and, in some cases, in increasing the volume of gases by the decomposition of steam or vapours employed to produce the current, and also by blending, or combining, or carbureting the gases injected (to produce the currents) whilst in rapid agitation or circulation in contact with the products of decomposition.

Secondly, in improved means or methods of producing a rapid separation of those condensable hydrocarbons from the crude gases which it is desirable to remove in the liquid form, and at the same time retaining in the gases the vapours of the hydrocarbons, which are valuable for imparting to the gas a high illuminating power. This is accomplished by causing the gas to pass through narrow passages kept heated, these passages being preferably of a tortuous nature, causing the gas to impinge or flow alternately from side to side, or by causing the crude gases to impinge in narrow or minute streams against heated surfaces; or alternately the crude gases themselves may be first highly heated, and then passed through narrow passages, or impinged against surfaces whilst in this heated state.

4779.—CHERRY, W. P., and C. E., Hull, "*Improvements in the manufacture of gas for illuminating and heating purposes, and in apparatus for the same; parts of which are applicable to other purposes.*" Provisional protection only obtained. Dated Dec. 11, 1876.

This invention consists, in the first place, of dissolving in water nitrate of soda or chlorate of potash, or other ingredient capable of giving off oxygen, so that when the water is boiled in a suitable apparatus, it will produce more oxygen in the steam than is contained in steam generated from water alone.

The second part of the invention consists of an arrangement of retorts or apparatus, whereby coal, peat, wood, coke, charcoal, or any carbonaceous substance is completely converted into gas by passing the oxygenated steam through the carbonaceous substances contained in the retorts, which are heated to a sufficiently high temperature.

The third part of the invention consists of an arrangement of hydraulic apparatus or air-tight chambers charged with water and benzoline, or petroleum spirit, through which the oxygenated steam, after passing through the carbonaceous substances contained in the retorts, passes to produce the required illuminating and heating gas.

The apparatus for producing the oxygenated steam consists of a boiler supplied with the dissolved nitrate of soda and water by any of the ordinary means. The boiler is heated by any means so as to produce steam. The retorts for holding the coal, peat, wood, coke, or other carbonaceous substances consist of one, two, or more, and are made of fire-clay or other suitable material, and made of a particular shape, so as to completely convert the contents into gas. The retorts are heated by fire suitably arranged. The hydraulic apparatus or air-tight chambers, which contain water and benzoline, or petroleum spirit, consist of a series of air-tight chambers fitted with a series of partitions and pipes for conducting the gas in and out of the water and benzoline, or petroleum spirit on its passage through the same. The hydraulic apparatus or air-tight chambers may be made of any shape desired, and provided with taps or valves, so as to charge the interior of the apparatus with water and benzoline, or petroleum spirit, and provided with taps or valves to let off the same when required.

When the above described apparatus has been connected together by means of pipes communicating one to the other, in order to produce the required illuminating and heating gas, the oxygenated steam from the boiler under pressure passes through the communicating-pipe to the retorts and through the contents of the same, and thence through the communicating-pipe and the hydraulic apparatus, and through the communicating-pipe to the gasholder or to the burner, to be consumed or otherwise.

4824.—FOULIS, W., Glasgow, "*Improvements in drawing retorts, and in the machinery or apparatus employed therefor.*" Patent dated Dec. 13, 1876.

This invention, which relates to improvements in machinery or apparatus for drawing gas-retorts, consists in certain modifications of the invention for which Letters Patent (No. 59, A.D. 1873) were granted to the patentee.

The object of the present improvements is to enable a considerable reduction in the weight and dimensions of the drawing apparatus to be effected, at the same time to diminish the wear and tear of the apparatus and to reduce the quantity of water used, by virtue of a smaller sized hydraulic cylinder being under this arrangement sufficient. These objects are carried out by making the piston-rod of the hydraulic cylinder a fixture at one end of a parallel frame, or to one end of a bar, and provided at the opposite end with a piston, over which the hydraulic cylinder, which, under the present invention carries the rake, passes. The hydraulic cylinder is provided with rollers or their equivalent, for the purpose of guiding the cylinder, in its motion, parallel with the frame or bar. The piston-rod is tubular, and is provided with a second tube or passage, whereby, in connection with a reversing-valve, the water under pressure (by means of which the apparatus is operated) is admitted to alternate sides of the piston, and the cylinder with its rake is driven forwards into, and draws the charge out from, the retort. The drawing apparatus, with its frame or bar, is suspended at or near the centre, from a chain or its equivalent, so that its position may be adjusted as required.

4842.—JOHNSON, S., Wood Green, "*Improvements in gas-meters.*" Provisional protection only obtained. Dated Dec. 14, 1876.

This invention relates to wet meters, and has for its objects improved methods of constructing and arranging the parts of such meters.

In carrying out the invention it is proposed to take a cylindrical drum, or measuring vessel, of sheet metal or other suitable material, which is fixed upon a horizontal axis revolving in bearings formed upon, or attached to, an outer case or box, within which the measuring drum is contained. The drum has a part of its circumference (preferably about one-fourth, or 90°) removed, and the remaining part is divided into two equal chambers, by a radial internal division extending from the axis to the circumference. At the bottom of the outer case are arranged two pipes (or one pipe divided into two by a longitudinal division), which rise vertically into the interior of the measuring drum, passing through the latter where its circumference is removed, and being bent or curved laterally so as to escape the axis, and rise to a sufficient height into one of the two chambers into which the drum is divided. Two precisely similar pipes (or one pipe divided into two by a longitudinal division) are arranged side by side with those first described, and rise to the same height into the other of the two divisions into which the drum is divided.

By the method of construction and arrangement described, the drum cannot make a complete revolution, but can oscillate backward and forward to an extent limited by the extent of its circumference which is removed, as already described, and through which the pipes pass. The upper ends of the two pipes (or the divided pipe), which rise into each compartment of the drum, are provided with a slide valve capable of a certain amount of lateral travel, and the sizes of each valve, and of the opening in the pipes which it covers, are so proportioned that whilst only one of the pipes can be opened at once, each is opened alternately by moving the slide valve backward and forward. A horizontal sliding bar is provided, having teeth or lugs upon its edge, which are actuated by a toothed wheel or segment or lever fixed to the axis of the drum, so that when the latter is made to oscillate backward and forward, as already described, the sliding bar is also made to slide or travel simultaneously backward and forward; and at or near each end of the sliding bar, bars, pins, or levers are arranged, which strike or actuate the slide valves, and drive them backward and forward. These pins, bars, or levers only actuate the slide valves at the extreme ends of the stroke of the sliding bar (and of the oscillating drum), and upon the upper part of the drum; or upon a lever on its axis, is arranged an adjustable weight which aids the movement of the drum and of the sliding bar at the ends of their stroke. One of each of the pipes (or one division of each divided pipe), after it leaves the drum case, is connected with an inlet gas-pipe, and the other of each of the pipes (or the other division of each divided pipe) is connected with an outlet gas-pipe, and the drum-case and drum are filled with water.

The proper level of the water may be regulated by any of the methods well known and practised for the purpose in wet gas-meters; but it is preferred to adjust and maintain it by the following novel arrangements. An external chamber is made in communication with the drum-case of the meter, so that the water stands at the same level in each, and the bottom of this chamber is provided with a hollow screwed socket, into which is screwed a vertical pipe. The hollow socket outside the chamber is provided with a moveable water-tight cap, and the upper end of the vertical pipe is provided with a hole, square or of other suitable shape, to fit a key which is introduced through an opening in the top of the external chamber. By this means the pipe can be screwed up or down until its upper edge exactly coincides with the level of the water in the meter when the latter is indicating correctly, and any surplus water passes down the pipe, and can be removed by means of the moveable cap when required. When the pipe has been adjusted to its proper height, the opening in the top of the external chamber is closed by a plate or screw cap, which may be sealed so that it cannot be interfered with. An adjustable valve is provided, actuated by a float upon the surface of the water, and adjusted in such manner that if the level of the water falls too low the valve closes the inlet-pipe, and so shuts off the supply of gas from the meter until the proper level of the water has been restored by the addition of a fresh supply. This may be furnished by any of the methods ordinarily used and practised.

4917.—GILL, J., Bridgnorth, "*A new or improved gas-stove.*" Patent dated Dec. 20, 1876.

The body of the stove consists of a cast-iron box or frame, by preference of a square or rectangular figure, and having within it a smaller box or frame, the inner box or frame forming the stove proper, and the outer box or frame the case of the stove. The space between the two boxes or frames constitutes a non-conducting chamber entirely surrounding the sides of the inner box or stove proper. This chamber is filled, by preference, with some imperfect conductor of heat, such as sand, plaster of Paris, or other earthy material. In the middle of the bottom of the stove is an opening through which air passes to the inner chamber of the stove, and the top of the stove is covered by a perforated plate or lid, through which the hot air from the stove passes into the apartment to be heated. In the inner chamber of the stove is a horizontal circular burner provided with a series of jets. To this burner a mixture of ordinary coal gas and air is supplied, air entering the gas supply-pipe by openings in it outside the stove. Suspended from the under side of the perforated cover or lid of the stove is a perforated horizontal plate, which is situated a short distance above the circular burner. The jets of flame heat this suspended plate, which acts as a heat diffuser, and also prevents any dust passing through the perforated cover of the stove from choking the jets of the burner.

In using the stove described, it is placed by preference in the floor of the building or apartment to be heated, the perforated cover being situated on a level with the floor. The outer case or box of the stove has on its exterior and near its top an overhanging shoulder or flange, by means of which the stove is supported upon the joists of the floor. When the stove is placed in the floor of the building or apartment, the non-conducting chamber of the stove keeps the external box or case so cool that the heating of the floor of the room is effectually prevented. Instead of placing the stove in the floor of the building or apartment, it may be supported on the floor by a stand.

4967.—STORER, J., and PUGH, C. H., Stafford, "*Improvements in retort-lid fastenings.*" Patent dated Dec. 23, 1876.

This invention has for its object the securing of the luted lids to the mouthpieces of retorts with ease and despatch, and consists in the employment of lugs attached to the mouthpiece in the ordinary way. To one of these lugs is hinged the cross bar, the other end of the bar falling into a catch on the opposite lug. At or near the centre of the cross bar rises a vertical pin, and through the thickness of the cross bar there is a horizontal slot in the direction of the axis of the retort. Through this slot a short bar, having a flange or collar at one end, and a vertical pin at the other, is made to slide.

To make the apparatus complete, a handle or lever having a hole near one extremity, and a curvilinear slot eccentric to the hole, is provided, and when placed in position the hole in the handle receives the pin or fulcrum fixed to the cross bar, while the slot receives the pin fastened to the sliding bar. The pin attached to the sliding bar may be adjustable.

The action of the apparatus is as follows:—The lid having been placed against the retort, the cross bar is thrown over till it bears on and takes



into the catch on the opposite lug, when by thrusting the lever or handle towards the retort, the pin which works in the eccentric slot, and, consequently, the sliding bar, is pushed forward until the flanged end of the bar touches the lid, and produces sufficient pressure thereon to form a tight joint between it and the mouthpiece. A reverse movement of the handle releases the lid from pressure, and it may be removed with facility.

5013.—KENNEDY, T., N.B., Kilmarnock, "*Improvements in water-meters.*" Patent dated Dec. 28, 1876.

This invention relates to water-meters of the positive and reciprocating class, such as that known as "Kennedy's," and comprises various improvements in details, having for their object to render the meter less liable to derangement. They relate more particularly to the four-way cock or valve by which the water is directed alternately to and from opposite ends of the cylinder or measuring chamber, and to parts immediately connected with this cock.

The stroke of the tumbling-weight, which, in the Kennedy meter, effects the shift of the valve or cock, in acting on either arm of the lever fixed on the cock spindle, has a tendency to move the cock plug on end, and the larger end of the plug having hitherto been towards the lever, the action has tended to jam the plug. By the present invention the smaller end of the valve plug is put towards or nearest to the lever, so that the end-way action tends to relieve the plug; and the plug, instead of being made with the usual slight taper, is made with a conical surface forming an angle of at least 30° of the circle with the axis, or it may be made flat, or of any angle between 30° and 90°. The cock plug is pressed into its seat, firmly but not rigidly, by a spring applied to its spindle or centre, the spring consisting, by preference, of a piece of vulcanized rubber faced with vulcanite. The spring is inserted in a small socket formed on the inside of a cover, which closes the opening by which the cock plug and its seating are entered into their places. The cock plug is, by preference, of brass or bronze, and its seating is of brass, or vulcanite, or lignum vitæ, and the cock plug is balanced, or nearly so, as regards lateral pressure due to any difference of pressure on the inlet and outlet sides of it, by having blank ports or slight recesses formed in its surface near its larger end, these ports being put in communication respectively by grooves with the opposite through-ways. The plug spindle passes out through a stuffing-box in the usual way, and has the two-armed lever fixed on it externally.

5035.—PAGE, W., Newcastle-on-Tyne, "*Improvements in valves, taps, or cocks.*" Patent dated Dec. 29, 1876.

This invention relates to valves, taps, or cocks for steam, water, or other fluid, in which the passage is an open way when the closing details are open. The closing details are moved across the line of the way or passage, and generally in a vertical direction, a valve chamber being formed for them on a short pipe piece made with faucet or other ends for connection in a line of piping, and they are moved by means of one or two plain or screwed spindles passed through stuffing-boxes in the outer end of the valve chamber.

Amongst the improved details are comprised two pieces which act as partners, and one of which is a valve-plate, shaped and fitted to close tightly against a valve seat, whilst the other is a partner plate or frame, which may be fitted to close tightly against a second seat facing the other one, or which, without acting as a valve, may simply move across the passage so as to keep opposite, or nearly opposite, to the valve-plate, and serve for closing and tightening the latter. A ball or spherically surfaced piece is interposed between the valve-plate and the partner plate, and, in consequence of the peculiar configuration of the parts, causes the valve-plate to be tightly forced against its seat by a movement which the partner plate has in excess of the valve-plate after the latter has reached its closing position. On opening the valve the jamming pressure is relieved prior to moving the valve-plate from over its seat. By the use of the ball or spherically surfaced piece the valve-plate is rendered free to turn on its centre, and it is made to encounter a stationary frictional surface when closing, so as to be turned a little every time in order that the wear on it may be equalized all round.

97.—COLLINGS, T. A., and PATERSON, T. O., Rochdale, "*Improvements in the production of material for and method of purifying coal gas, and in apparatus used for that purpose.*" Patent dated Jan. 9, 1877.

This invention has for its objects the production of an improved liquid material for purifying coal gas; an improved method in so far as the gas is subjected to a less quantity of liquid, thereby preventing the liability to lose some of the hydrocarbons upon which the illuminating power of the gas depends; and an improved apparatus for the manufacture of the said material.

The invention has reference, in the first place, to what is known as desulphuretted gas liquor—that is to say, the driving off or expulsion of the sulphuretted hydrogen and carbonic acid from the gas liquor as it ordinarily comes from the hydraulic main, condensers, or other apparatus used in the manufacture of gas.

This driving off or expulsion is effected by the use of the following process and apparatus:—Gas liquor is allowed to flow into the top of a scrubber partially filled with coke, wooden boards, or other suitable material. The liquor falls down and runs away, by means of a pipe furnished with a stop-cock, and attached near the bottom of the scrubber, into a boiler set over a furnace. To the top of the scrubber is attached a pipe which leads to a purifier charged with oxide of iron or other suitable purifying material, or to a furnace. The liquor in the boiler is heated to about 180° Fahr. This causes the separation of the sulphuretted hydrogen and carbonic acid, together with a portion of ammonia from the liquor. The gases so disengaged pass up either the same pipe by which the liquor flows into the boiler or by a separate one; in either case, however, the gases are introduced near the bottom of the scrubber, and ascend against the current of liquor falling from above, and find an exit from the top of the scrubber by the pipe which leads the gases to the purifier or furnace before mentioned. The ammonia is, however, arrested by the falling liquor in the scrubber, and is returned to the boiler.

The process of desulphuretted the liquor, as just described, is not new, and is not, therefore, claimed as part of this invention, although the apparatus by which it is effected is somewhat simplified. Instead, however, of using the liquor so desulphuretted for the purification of gas, the following is adopted:—The boiler is made of the still shape—that is to say, with a still-head or its equivalent—and is furnished with a descending pipe, which is continued in the form of a coil or zig-zag arranged within a tank into which cold water is admitted, and continues to flow. From the end of the pipe in the tank is another which leads to a concentrated liquor store, vat, or tank. At or near where the pipe joins the still-head a valve is inserted, and at or near the bottom of the boiler is a pipe for conveying away weak liquor.

The liquor having been admitted to the boiler until nearly full, and desulphuretted as before described, is treated as follows:—The flow of liquor from the scrubber is stopped by shutting off the cock attached to the pipe leading from the scrubber to the boiler, and the valve in the neck of the still-head is opened. The temperature is then raised to boiling, and continued until the whole or nearly the whole of the ammonia contained

in the liquor is driven off, together with some vapour of water, and condensed by the cooler before mentioned; the result being a highly caustic solution of ammonia, which is run off into the store vat before alluded to. The refuse or weak liquor remaining in the boiler may now be run off, and used to wash the gas which has been previously subjected to the caustic ammonia, so as to wash out any ammonia that the gas may have absorbed from the caustic liquor, and for this purpose it is preferable to water, since it is less liable to affect the hydrocarbons; or the weak liquor may be otherwise disposed of as discretion may dictate. The still-head valve being shut, and the liquor supply-cock opened, the desulphuretted process may again be proceeded with.

The solution of caustic ammonia, made as described, being comparatively pure, may be used with great advantage in the purification of gas from both sulphuretted hydrogen, sulphur compounds, and carbonic acid, by submitting the gas to its action, either in scrubbers, washers, or other suitable vessels, and from its being used in a concentrated form, the gas is not so likely to have its hydrocarbons absorbed as when a greater quantity of weaker liquid is employed for the same purpose. By the use of such concentrated liquor also smaller purifiers may be used, thereby effecting an economy in expenditure on plant, together with a reduction in the quantity of purifying material subsequently employed.

It is not absolutely necessary that the boiler used for desulphuretted the liquor should also be used as the still for concentrating the liquor, as the liquor may be run off from the boiler to a separate still; but on the ground of economy it is preferable to use the same apparatus for both purposes.

The vessel used for desulphuretted the liquor may be so arranged that the temperature may be kept up by the exhaust steam produced on the works being made to travel through a series of pipes immersed in the liquor, while steam from a special boiler may be injected into the liquor, whenever the boiling or distillation is necessary.

121.—DRONIER, P., Paris, "*Improved means for lighting gas by electricity.*" Provisional protection only obtained. Dated Jan. 10, 1877.

This invention consists in a means of lighting gas-burners, either separately or simultaneously, by bringing the gas coming from the burners in contact with a platinum wire heated to red heat by means of electricity in any suitable manner.

To prevent any alteration in the platinum wire, it is so placed that the heat of the flame shall not be sufficient to exercise its action upon it; or it is removed away from the flame as soon as the lighting has taken place. Arranged near the burner is a tube containing the wires conducting the electricity, and which can partly turn on an axis in such a manner that this movement opens the tap or cock, establishes contact, and draws the platinum wire opposite the current of gas. The opposite movement breaks the contact, and draws back the platinum wire to its normal position. There is placed on or near the burners one or several electro-magnets for drawing the platinum wire, at the moment of lighting, opposite the burner, by the effect of a derivation of the electric current employed for lighting.

For lighting street-lamps without opening them, a rod or pole is employed, provided with a portable battery acting on a moveable platinum wire placed in the lamp, and brought momentarily in the currents of gas just when the rod carrying the battery opens the cock and establishes the contact. The platinum wire is provided with two supports which pass through an insulator which is incombustible, such as bone or ivory, or into a metallic piece, from which they are isolated by means of a suitable insulating and incombustible material, such as mica.

169.—TONGUE, J. G., Southampton Buildings, London, "*Improvements in means and processes for obtaining colouring matters from cannel, anthracite, and other coals, applicable to various useful purposes.*" A communication. Provisional protection only obtained. Dated Jan. 12, 1877.

According to this invention, fossil coal or cannel coal, or anthracite or Boghead coal, are treated advantageously in fine powder with oxidizing chemical compounds by ordinary or higher temperatures in suitable vessels. The most advantageous method of carrying out these improvements is to heat the different coals, finely powdered with nitric acid or with potassic or sodic nitrate and sulphuric acid. Also potassic chlorate or potassic chromate, or hypochloride of lime or compounds of manganese, may be used for the reaction with or without an acid.

By this method of decomposition, the salts of strontium, of barium, of magnesium, of aluminium, of manganese, of iron, of cobalt, of nickel, of zinc, of cadmium, of lead, of tin, of copper, and of chromic oxide are obtained. All these bodies are black, or black brown, or brown colours, which may be mixed with other colouring matters. They can be used for painting, printing, and colouring. These colours are obtained as precipitates, and can be purified by water.

The alkali solution can also be decomposed by soluble metallic salts, and used by the dyer.

The alkali solution can also be decomposed by acids. A black brown precipitate is obtained, which may be washed in water, and which may also be used as a colouring matter. This black precipitate is the acid in which the coals are partly converted by the treatment with oxidizing compounds.

By the above described means fossil coal is oxidized, and the black residue obtained by the decomposition of the oxidized fossil coal may be applied as a colouring matter to various useful purposes.

196.—GROUD, H., Paris, "*Improvements in rheometric regulators for gas-burners.*" Patent dated Jan. 15, 1877.

These improvements relate to the construction of gas-regulators described in the specifications to former patents, Nos. 315, of 1870, and 1953, of 1872.

According to the present improvements, the disc is fixed to an annular slide or sleeve, which slides upon a tube projecting downwards from the outlet orifice, and closed at its lower end. There is a slit at the upper part of the tube, through which the gas in the casing above the disc passes into the interior of the tube and thence to the burner. On an increase of pressure occurring, the disc, with its sleeve, is raised more or less, and is thus caused to close the slit to a greater or less extent. There is a space formed in the casing at the side of the chamber, in which the disc is situated, a hole being formed in the partition, so that the gas which enters the space from the inlet can pass into the chamber through the hole above the disc, as well as through the annular space between the disc and the chamber. The size of the hole, and consequently of the passage of the gas through it, is regulated by advancing a screw plug, screwing through a neck in the side of the casing, more or less towards or into the hole. The outer end of the neck is closed by a screw cap.

234.—LOW, W., Birmingham, "*Certain improvements in taps or cocks for steam, water, or other similar purposes.*" Provisional protection only obtained. Dated Jan. 18, 1877.

This invention consists in the construction of a tap or cock upon the anti-friction or anti-packing principle, and the object of the invention is obtained by employing a tapered plug working in a solid bottomed barrel, and kept in its place by a recessed cover. Upon the upper part of the tapered plug is an incline, and this traverses up a corresponding incline on the cover; thus, with the action in one direction, the tap is secure or tight when desirous of shutting off, but with a contrary action it is



released or turned on. In the interior of the cover is placed an india-rubber washer in the form of hydraulic packing, which tightens itself when pressure is applied, or a solid india-rubber washer may be employed bearing upon the top of the tapered plug, keeping it in its place, also tightening the spindle.

259.—TASSIE, P., Manchester, "Improvements in the means or arrangements for closing the mouthpieces of gas-retorts, and in tools for applying the same." Patent dated Jan. 20, 1877.

This invention consists in making the joint between the face of the lid and mouthpiece of the retort by applying a steel ring of circular cross section, which can be readily renewed, the ring being pressed into a groove formed in the edge of the mouthpiece. The groove is under-cut on its outside edge, so that the ring, being slightly elastic, is easily pressed in and held therein, the under-cutting allowing also for all differences of expansion between the steel ring and the cast-iron mouthpiece. The ring may be solid; but it is preferred to make it of wire of the exact length, bent to the form required, the two ends simply abutting against each other; also to make the lid of ordinary concave form on its inner face, having a boss in its centre, with a square hole in it to fit the square end of a screw, which screws through a cross-bar hinged to one side of the mouthpiece. The cross-bar is turned on its hinge until the lid is brought against the face of the mouthpiece, and the free end of the cross-bar then latches on a hook or catch secured in the side of the mouthpiece. The screw is then rotated, and with it the lid, and this brings the lid close up against the steel ring, and makes the joint tight. The lid may be cast iron, chilled on the edges; and there may be a stud in the lid to limit the amount of back-motion in the screw, and help to unlatch the cross-bar when the retort is to be opened.

The invention also relates to tools to be employed for cutting the groove for the steel rings and facing the mouthpieces of retorts, both for new rings and when rings require replacing, and for other facing purposes. The mechanism will be useful, both when the mouthpieces are moveable, and when they are in the position in which they are used, and it consists in a combination and arrangement of mechanism—namely, of a T-edged disc, or a pulley, or a disc, or its equivalent, and adjustable brackets, with a stem perpendicular to the disc. The disc is secured, or its adjustable brackets are secured centrally by set-screws in the T-flange or adjustable brackets into the mouthpiece of the retort. Upon the stem there is a boss, which can rotate round the stem, this boss having an arm upon it that carries a compound tool slide, with screws for moving them, one slide moveable at a right angle to the other, the upper slide carrying the cutting or turning tool. To the front of the stem an arm is secured by a bolt, which also forms an axis for a crank hand-wheel, upon a boss of which there is a spur pinion that gears with a spur-wheel upon a short shaft having bearings in the arm, upon the end of which short shaft there is a pinion that gears with a wheel secured to the boss carrying the compound slides, which is thus rotated. The fixed arm carries an adjustable finger or fingers, which will act upon the screws for self-acting the slides when required. The mechanism may be driven by steam or other motive power, if required.

351.—HARRISON, C. W., Mansion House Chambers, London, "Improvements in apparatus for charging or impregnating atmospheric air with inflammable vapours." Provisional protection only obtained. Dated Jan. 27, 1877.

This invention relates, firstly, to a new form of construction of generator; which is made of a shallow enclosed box of rectangular or other suitable form, and constructed of copper, tin plate, or other suitable material. Internally it is provided with parallel vertical partitions joining the top and bottom plates, and alternately one or other of the sides of the box.

The invention relates, secondly, to an improved form or construction of blower for forcing the air through generators; which is made of a collapsible vessel of cylindrical or other form, the top and bottom of which are of wood, metal, or other suitable rigid substance, and the sides of any suitable flexible air-tight material. A valve, or valves are provided, opening inwards from the atmosphere when the ends are drawn apart, by which means the vessel is filled with air; and on pressing the ends together, by a weight on the top, the valves closes, and the air contained in the vessel is forced through a second valve opening outwards, through a pipe communicating with the generator, at a velocity proportionate to the pressure applied to the collapsible vessel, which pressure may be adjusted to suit the number of burners to be supplied with the inflammable gas or fluid.

413.—HUNT, B., Serle Street, London, "Improvements in pipe-joints." (A communication.) Patent dated Jan. 31, 1877.

The object of this invention is to effect a practical and economical jointing of pipes used for conveying water, gas, compressed air, and other fluids, so as to make a perfectly tight joint. It consists in the use, in combination, of clamps having internal beads; also in the use, in combination, of clamps having internal beads, also in the combination of clamps having internal beads and projections and recesses on their ears; and in the use, in combination, of clamps having internal beads, and formed with or without projections and recesses on their ears, and with an internal recess, with suitable packing, in jointing cylindrical adjacent ends of pipes provided with exterior end beads.

#### APPLICATIONS FOR LETTERS PATENT.

2239.—ALLAN, W., Kilburnie, N.B., "Improvements in and connected with mine and other pumps." A communication. June 5, 1878.

2278.—BOULTON, M. P. W., Tew Park, Oxford, "Improvements in gas motor engines." June 7, 1878.

2281.—SIEMENS, C. W., Westminster, "Improved means and apparatus for distributing and regulating electric currents to work lamps and other electric apparatus." June 7, 1878.

2285.—VACHEROT, A., Battersea, London, "Improvements in rotary engines, rotary pumps, and other like apparatus." June 7, 1878.

2299.—HADDAN, H. J., Westminster, "Improvements in gas-burners." A communication. June 8, 1878.

2350.—ABEL, C. D., Southampton Buildings, London, "An improved manufacture of combustible gas for illuminating and heating purposes, and apparatus and lamps employed for that purpose." A communication. June 13, 1878.

#### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

4768.—PEARNS, F. and S., Manchester, "Improvements in valves for pumping water, air, and other fluids." Dec. 15, 1877.

4865.—SILBERMANN, A., Berlin, "Improvements in gas blow-pipe machines." Dec. 21, 1877.

4919.—WILSON, J. G., Manchester, "Improvements in and apparatus for carburetting gas to increase its illuminating properties." A communication. Dec. 28, 1877.

92.—EAST, W., Kingston-on-Thames, Surrey, "Improvements in the treatment of sewage and other waters, for the purpose of purifying the same." Jan. 7, 1878.

1006.—BERNAYS, A. J., Lambeth, London, "Improvements in filters for purifying water." March 13, 1878.

1092.—MORGAN-BROWN, W., Southampton Buildings, London, "Improvements in fluid-meters." A communication. March 19, 1878.

1267.—CLIFF, W. D., Wortley, Yorks, "Improvements in the manufacture of furnaces for gas and other works." March 30, 1878.

#### PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1895.—HILLS, F. C., "Improvements in the purification of gas, and in the preparation of materials to be used in the said purification." May 24, 1875.

1953.—JONES, F. C., "Improvements in supplying and regulating the supply of water by means of a self-acting apparatus, for urinals and other purposes." May 28, 1875.

1994.—BROOKES, W., "Improvements in means or apparatus for conducting and controlling the flow or passage of water, gas, or other fluids or vapours." June 1, 1875.

2000.—SCHÜSSLER, C. F., "Improvements in hydrocarbon gas apparatuses." June 1, 1875.

2016.—BRUCE, DE V., and ANTISELL, T. M., "An improved engine for utilizing the expansive force of vapours or gases, either by gradual pressure or explosion." June 2, 1875.

2030.—DYKES, W., and SCOTT, J., "Improvements in taps or valves for controlling the flow of liquids or fluids." June 2, 1875.

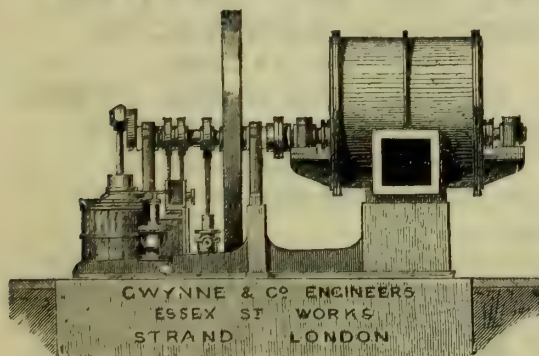
2067.—KEY, W., "Improvements in station gas-governors." June 5, 1875.

2076.—WOOD, R. J., "Improvements in retorts, furnaces, and other close heating vessels or chambers." June 5, 1875.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS;

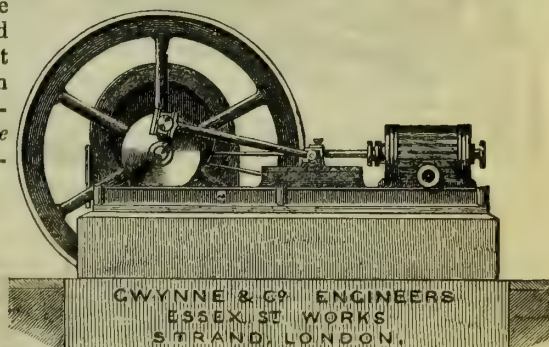
Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

## GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

52,500 EXHAUSTER, with Horizontal Engine combined.



**WANTED, by the Middleton and Tonge Improvement Commissioners,** a person well qualified to **SUPERINTEND and MANAGE** thoroughly the **GAS-WORKS**. He will be required to devote the whole of his time to the duties of the Office. Salary to commence at £160 per annum.

Applications, with testimonials, addressed to the Chairman of the Gas Committee, to be delivered at my Office, on or before Monday, the 24th inst., not later than six o'clock in the evening, endorsed, "Application for the Situation of Gas Manager."

FREDERICK ENTWISTLE,  
Clerk to the said Commissioners.  
Commissioners Rooms, Gas Street, Tonge,  
Middleton, near Manchester, June 7, 1878.

**A Gas Manager, presently in charge of** Gas-Works in Scotland, is desirous of having charge of Works abroad. Trained in the Accountant and Working Departments.  
Address No. 467, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**A Young Man, aged 22, who has just** finished a four years engagement with a provincial Gas Company is open to take a situation as Manager of small Gas-Works, or as Assistant to the Engineer of large Works. Can give first-class testimonials. Has no objection to go abroad.  
Address No. 460, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, by a Young Man, aged 22,** who has had five years experience in a Provincial Works (make, 75 millions), a SITUATION in a Gas-Works. Can use Photometer, fair Draughtsman, good Writer, quick at figures, and thoroughly understands general routine.  
Apply S. I. C. E., 54, Hardress Street, RAMSGATE.

**WANTED, to invest from £5000 to £20,000 in the PURCHASE of Gas-Works.**  
Apply, by letter only, with full particulars, to No. 466, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, by a Gentleman, aged 29, a** Situation as **MANAGER** of a Gas-Works on the Continent or abroad. Advertiser has been about seven years in present situation as Engineer and Manager, where the make of gas is about 150 million cubic feet.  
Thoroughly understands the erection of works, also the manufacture and distribution of gas in all its branches. Speaks French and Italian. Can leave present situation immediately. Excellent testimonials.  
Address C. E., care of Messrs. Dawson and Sons, Cannon Street, LONDON.

**WANTED, by Samuel Thompson & Co.,** Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.  
John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

**WANTED, Orders for Samples to test** the superior Silkstone, Wigan, and other Gas Coals and Cannel on Sale by G. J. EYSON, Gas Coal and Cannel Contractor, BIRMINGHAM.  
N.B.—Prices on personal application, or by post or telegram, on shortest notice, and prompt delivery.

#### NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to  
FRANK M'GEDY, Secretary.  
126, Chancery Lane, London.

BUENOS AYRES GAS COMPANY, LIMITED,  
SIX PER CENT. DEBENTURES.

**NOTICE is hereby given to the Debenture** Holders of the Buenos Ayres Gas Company, Limited, that the Half-Yearly Coupons, at the rate of six per cent. per annum, due on the 1st of July next, will be paid on and after that date at the Company's Bankers, Messrs. Prescott and Co., Threadneedle Street, London. Coupons must be left at the Bank three clear days for examination.  
By order,  
E. W. LAYTON, Secretary.  
1, East India Avenue, Leadenhall Street.

**WANTED, Readers of the Pamphlet,** "Cooking and Heating by Gas; on Burners," &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Gas-Works, SYDENHAM, S.E.

**CARBON.—For Sale, at the Wrexham** Gas-Works, about 20 Tons of RETORT CARBON.  
Tenders to be sent to the MANAGER.

**FOR SALE, by the Swindon Gas and** Coke Company, Swindon, Wilts, an old TELESCOPIC GASHOLDER, 30 ft. 6 in. diameter by 16 ft. deep, with four cast-iron Columns 17 ft. long, and Tie Bars; also the Bricks forming the Tank for the same. To be removed by and at the expense of the purchaser.  
Tenders to be forwarded to the Secretary on or before the 1st of July, 1878.  
The Company do not bind themselves to accept the highest or any tender.  
HENRY HUNT, Secretary.

**TWO Purifiers, 6 ft. by 4 ft., 6-in. Valves** and Connections, with Lifting Apparatus and Girders complete; also a Set of Twelve Pipe Condensers, all in working order, to be SOLD, a bargain.  
Apply to Manager, Gas-Works, ENFIELD.

**ON SALE—A Station-Meter (with new** Drum), capable of passing 10,000 cubic feet per hour, with Hydraulic Valves, Bye-Pass, &c.; 10-in. Connections. Has been removed to make room for one of larger capacity. For particulars and price, apply to GEORGE NEWTON, Gas-Meter Manufacturer, Union Street West, OLDHAM.

RIPON CORPORATION GAS-WORKS.  
**EXHAUSTER for Sale (by Dempster),** with Engine, Bye-pass Valve, and Governor complete, capable of passing 3000 cubic feet per hour. Has been five years at work, and is in good repair, being sold to make room for a larger one.  
Apply to GEO. IRVINE, Gas-Works, RIPON.

**YEO'S PATENT ENGINE PACKING,**  
Price 1s. 8d. per lb., any size.  
Tarred & White Spun Yarn for Pipe Joints, at various prices.  
Samples and testimonials free per post.  
E. YEO, NEWTON ABBOT.

#### PURIFIERS WANTED.

**TWO Purifiers, 5 ft. square by 2 ft. 6 in.** deep, with Wood Grids or Sieves, and Dry Centrifugal Valve for four Purifiers; 5 in. Connections, with Connectors and Covers complete.  
Tenders to be received previous to meeting of the Board on the 1st of July next by  
WILLIAM KELLY, Clerk to the Commissioners.  
Athlone, June 8, 1878.

#### GAS TAR and AMMONIACAL LIQUOR.

**WANTED, Tenders for the above products,** or either of them, for One or more years from the 1st of July next. Quantity, about 10,000 Gallons of each per annum.  
Tenders to be sent on or before the 21st of June to the undersigned, who will give any further information.  
JOHN PATTINSON.  
Gas-Works, Cockermouth.

#### TO IRONFOUNDERS.

**THE Gas Committee of the Buxton Local** Board invite TENDERS for the Supply of about 1680 Yards of 12-in. Turned and Bored Cast-Iron PIPE Specification and forms of tender to be had of Mr. C. Smedley, Gas-Works, Buxton.  
Tenders, endorsed "Gas-Pipes," addressed to the Chairman, must be sent in on or before Monday, the 24th inst.  
JOSIAH TAYLOR, Clerk to the Board.  
Buxton, June 6, 1878.

LONGFORD GAS COMPANY, LIMITED, IRELAND.  
**THE Directors of the above Company are** prepared to receive TENDERS for the Supply of 35 Tons of Best GAS COAL, delivered free into railway waggons, at North Wall, Dublin. One-half to be delivered immediately, and the remainder in September.  
Tenders must be sent in on or before Tuesday, the 25th inst.  
WILLIAM KEDDIE, Secretary.  
Gas-Works, Longford, June 11, 1878.

#### CIRENCESTER GAS COMPANY, LIMITED.

**THE Directors are prepared to receive** TENDERS for 600 Tons of Real Old Silkstone GAS COAL, 600 Tons of Best Forest of Dean GAS COAL, and 300 Tons of Through Penygraig WELSH COAL, to be delivered at Cirencester Station during the next twelve months, at such times and in such quantities as the Manager of the Gas-Works may direct. Also for the Purchase of the Company's COKE. The Contractor to remove the same as required by the Manager.  
Tenders to be sent to J. BEECHAM, Secretary to the Gas Company, 76, Castle Street, CIRENCESTER, on or before the 1st of July.

#### TO MANUFACTURING CHEMISTS, &c.

**THE Directors of the Clayton, Allerton,** and Thornton Gas Company are prepared to receive TENDERS for the Purchase, at per Ton, of all the Surplus TAR and AMMONIACAL LIQUOR produced at their Gas-Works in Clayton, from July 1, 1878, to June 30, 1879. The Contractor to load and cart the said material at his own cost.  
Sealed tenders, endorsed "Tender for Tar and Liquor," to be delivered, addressed to the Chairman at the Gas-Works, at or before noon on Saturday, the 29th of June inst.  
The Directors do not pledge themselves to accept the highest or any tender.  
By order,  
JOHN NIVEN, Secretary and Engineer.  
Gas Offices, Clayton, near Bradford,  
Yorkshire, June 15, 1878.

## BEALE'S IMPROVED PATENT GAS EXHAUSTERS

WITH

## Wrought-Iron Spindles and ENGINES COMBINED.

SOLE MAKERS,

**GEORGE WALLER & CO.**

MAKERS OF ENGINES, EXHAUSTERS,  
INDEX AND DISC GAS-VALVES,  
HYDRAULIC MAIN VALVES,  
BYE-PASS VALVES,  
TAR, LIQUOR, AND OTHER PUMPS,  
SCRUBBERS AND PURIFIERS,  
CONDENSERS, BOILERS, &c.

Awarded Silver Medal at the Manchester Exhibition of the Society for the Promotion of Scientific Industry.

Phoenix Engineering Works:

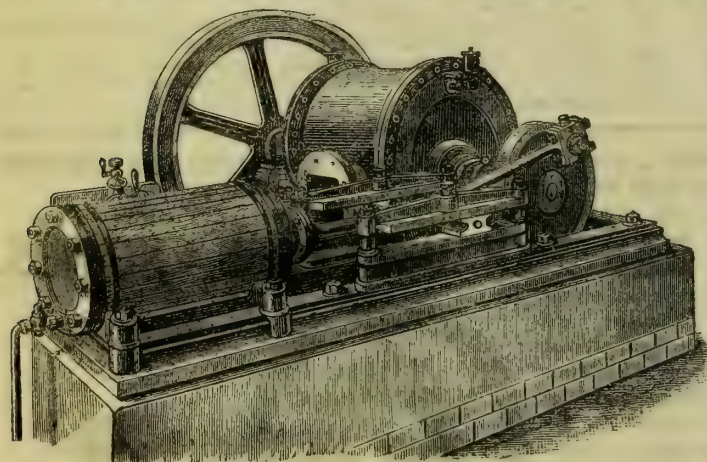
**HOLLAND STREET, SOUTHWARK, S.E.**

**TO GAS ENGINEERS.**

**D. BRUCE PEEBLES & CO.**

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

**TAY WORKS. BONNINGTON, EDINBURGH.**





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## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

## THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 25, 1878.

## Circular to Gas Companies.

THE meeting of the British Association of Gas Managers, which has just concluded, as every one who attended will admit, was one of unsurpassed success. Former, and indeed, we may say, every one of the meetings, has been agreeable and instructive; and it is not saying too much that the last equalled in agreeableness and instructiveness any one that preceded it. But the meeting is not yet over. At the time we write, the Members are in Paris, with lovely weather, and everything around them to satisfy the senses and gratify the intellect. We hope the fine weather will last, and that the Members will return to England highly pleased with their visit. There is, as we said last week, a great deal to be learnt in the Paris Gas-Works; but we will not offend any one's sensibilities by pointing out what, in our humble opinion, is most worthy of notice and copy. Let every one see and observe for himself, and then we are assured that, as opportunity offers, some changes of plant and practice will be made in some of our gas establishments. Perhaps the objects of the meeting

may not take the Members to the Rue Condorcet; but we cannot help thinking that the Directors who have visited Paris must have been struck with envy at the sight of the magnificent suite of offices belonging to the Gas Company. If we have nothing to match them in London, it is because our interests are scattered and divided. Union would enable us to indulge in luxuries and conveniences such as are enjoyed in Paris.

To return to the Adelphi, however. We may say that we do not commence our report of the proceedings to-day, because this is the last number of a volume, and it will be convenient to our readers to get the whole of the report in one. We may, however, make a few remarks upon the leading features of the President's Address. In the first place, it is gratifying to us, as to the President, to witness the increasing growth of the Association. It shows how highly the advantages which the Association offers are appreciated; and yet we are not certain that they are even now sufficiently recognized. The roll of Members does not include all English Managers, as we hope it will before long. It is true that a variety of Local Associations are in existence, and we see that the number is being added to; but, useful as these small societies are for colloquial intercourse, we much question whether they are so beneficial in their results as the larger gathering, which offers the opportunity of making a wider acquaintance with men, and a fuller interchange of ideas. For this reason we trust the British Association will continue to increase, and, with the President, hope that another year will find the Members with a larger time at their disposal for useful work.

The President was perfectly right in insisting that it is the duty, as it is to the interest, of the Directors and Corporations to give their Managers more time and more means to attend these meetings. The discussion on several papers was necessarily curtailed, and on some no discussion at all took place. This may not have been of much consequence; but discussions often bring out points of great interest, which are not alluded to in the papers that provoke them.

The rapid progress of gas industry is bringing about some changes, upon which we may congratulate ourselves. The Manager of to-day is not exactly the kind of man who undertook the management of gas-works forty years ago. There were great men, it is true, in those days—men whose names will be honoured as long as the art of lighting by gas exists. But there were relatively few. Now, although we may not have a Clegg, a Lowe, or a Grafton, we have men whom their practice and teachings have instructed, established all over the country. Something more, however, is wanted. We are not exactly in love with any examination system; but the time is fast coming when Gas Managers will be expected to have a special training, and it may be a function, some day, of the British Association of Gas Managers to prescribe some course of instruction which will qualify gentlemen to fulfil their duties.

Managers are required to know something of many arts and sciences; their case, in fact, somewhat resembles that of the doctors. Although we have no desire to subject them to a similar training, some course of instruction would be advisable, if it could be followed. Engineering is the chief point to which attention should be directed. Architecture and Construction are also necessary parts of a Manager's training. The study of chemistry must also form an essential part in his education.

The subject of commissions was, of course, lightly touched upon by Mr. Woodall. With the opinion which we have repeatedly expressed he perfectly agrees—viz., that equal dishonour attends him who gives and him who takes. We hope the time will shortly arrive when Gas Managers will no longer be tempted; but the system has been so many years in existence that to eradicate it will take a long period. Time was, we believe, when it was considered a correct thing for a Secretary to take commission on coals, and for an Engineer to take the same upon everything else that was bought by the Company. Ideas are, however, changing, and as a Manager's services begin to be better appreciated, and more highly remunerated, the pernicious commission system will come entirely to an end.

We are here reminded that, when speaking of additions to salaries of Corporation Gas Managers, some objections were taken to remarks recently made in our columns. We never intend to speak with disrespect of Corporations, unless we think they deserve it. We entirely object to their having possession of gas and water undertakings, which we regard as purely commercial enterprises, and as foreign to the proper functions of a governing body as would be the supply of bread and meat. Pushed to a logical conclusion, the arguments which are indulged in when a Corporation Gas Bill is considered, would justify the supply of every edible and drinkable commodity by a Local Authority. Meat and bread are as much, or more, necessities of life than gas and water, and it may be that some day these may be demanded



from a Local Authority. We have, in fact, seen a hungry mob around a Vestry Hall, howling for bread, and such a sight will probably be seen again. Apart, however, from considerations of this kind, we are by no means averse to the possession of gas undertakings by Corporations; but the misfortune is that corporate work must be done to a great extent in public. Corporations cannot wash their dirty linen in secret, and we certainly do think it a great misfortune that, when the question of a small increase in a Manager's salary is brought under consideration, remarks should be made, and necessarily published, which cannot fail to give pain to the gentleman whose case is being discussed. We know that similar discussions take place at Boards of Directors, but these are secret. Managers at these meetings have not their ability and skill discussed in public. The only hint we desire to give to members of Local Authorities, when personal matters come up for debate, is, that they should content themselves with voting, and refrain from speaking.

We shall have occasion, as we publish the proceedings at the meetings of the Association, to refer to many things which, for the moment, we are compelled to put aside; now, as we said before, we content ourselves with noticing only the chief features of the meeting. One thing, which caused us some pain and regret, was the absence of faces which, if our memory serves us, have always been seen at previous gatherings. Among the absentees we may mention Mr. Goddard, sen., of Ipswich; Mr. Douglas, of Portsea; Mr. Paterson, of Warrington; Mr. Hutchinson, of Barnsley; Mr. Simpson, of Rugby; Mr. Martin, of Ormskirk; Mr. Andrews, of Swansea; Mr. Garnett, of Ryde; and Mr. Wood, of Hastings. As time rolls on, the list of original Members must necessarily be thinned; but we cannot part with old acquaintances without regret. Some of the gentlemen we have named, we know, are hale and strong, and we can only suppose that important business detained them at home. The rest have our hearty wishes for a speedy restoration to health, which will enable them to be present at the next meeting, to be held at Newcastle-on-Tyne, under the presidency of our veteran friend Mr. Warner, of South Shields.

Of the festivities we need say but little. The dinner was good, the company genial, and the speeches excellent. The entertainment at the Phoenix station, on the following day (in the preparation of which a lady evidently had a hand), and that at Bushey, were simply perfection. We believe that the Members will long hold in their memories the meeting of 1878.

When speaking of the winding-up of the Stafford Gas Company last week, we were, by local reports, led into an unimportant error. The Stafford Improvement Act, 1876, makes it, we find, obligatory on the Company to divide the whole of the purchase-money among the Shareholders, leaving nothing to be distributed, by way of compensation, among the Directors and Officers. It was not, therefore, niggardliness on the part of the Shareholders which left the eminent services of their Directors and Manager without substantial recognition. It is now a voluntary business, and we hope that the long service of their Manager, who is a man of mark in his profession, will receive at the hands of the Shareholders the reward he deserves as the Company expire. The Directors, several of whom have been in office for many years, during some of which they received no remuneration whatever, will also, we hope, be remembered.

The gas accounts of the Corporation of Rochdale show very favourable results for the past year's working. The reduction made in the price has evidently brought new consumers, and, although the consumption has not increased, profits have been maintained. The works appear to be in a transition state, but will presently take their place as equal to any Corporation works in England.

Gas is so often abused by doctors, that it is pleasant to find in a medical periodical an article which defends its use, and shows that, taking light for light, the consumption of gas vitiates the atmosphere of a room less than any other illuminating agent. We pass by sulphur compounds, which are, of course, peculiar to the burning of gas, with the remark that the quantity of these, and their effects on both health and furniture, are always over-estimated. We note this paper, which will be found in another column, for it looks like a return to common sense on the part of the medical profession.

### Water and Sanitary Notes.

EVERYBODY knows that England has a Registrar-General, and that somewhere in Somerset House there is a comfortable apartment with an easy-chair, a Turkey carpet, and an official table, at which important business is transacted. The functions of the Registrar-General, as the name indicates, are to collect statistics of births, deaths, and marriages—work which, we are bound to

say, is remarkably well performed. But certain officials in the department persistently wander from their proper duties, and trouble their heads with matters which by no means concern them. Thus, in the valuable "Summary of Births, Deaths, and Causes of Death in London and other Large Cities for 1877," recently issued, we find the writer going altogether out of his way to give a statement of the accounts of the Metropolitan Water and Gas Companies. The object is, of course, to show that, under Municipal arrangements, capital might be more cheaply raised, and, profits remaining the same, a considerable excess of revenue left for application to public purposes. In other words, the writer suggests that the Companies should be bought up, and the supply of gas and water be placed in the hands of some governing body. Now, this is altogether out of place in the document we notice. The Registrar-General is in no way concerned with the gas and water supply, except in so far as they concern public health. The financial position of the Companies is entirely outside the business of the Registrar-General.

London continues to be the healthiest large city in the world, and there can be no doubt that one essential element conducing to this healthiness is its excellent and plentiful water supply. The rate of mortality last year was below the average; but, at the present time, it is too early to speculate or dream of a maintenance of this low rate. We sincerely hope that it may continue; but the consequences of our new sanitary arrangements are not yet fully established. That our main drainage system, which, we read in this summary, has been completed after twenty years exertion, has been productive of excellent results, we have no doubt; but other things may have contributed to the general healthiness, of which an official statistician takes no notice. London is in course of transformation; the Artizans Dwellings Act will, in time, effect most valuable improvements, and, it may be, epidemic diseases will become more and more rare. We do not expect that either typhoid fever or small-pox will entirely cease; but the more air that is admitted into our streets and dwellings, will undoubtedly render them less liable to become epidemic.

That the manufacture of sulphate of ammonia can be conducted so as to cause no offence, is, in our opinion, beyond question, and we shall, therefore, not quarrel with the recent judgment at the Court of Queen's Bench. Sulphuretted hydrogen is a nuisance of the foulest character; not that it produces disease, although a medical man has written that it is the specific poison of scarlet fever; but simply because it is offensive to the sense of smell. Escaping vapours from the manufacture of sulphuric acid, less disgusting in their character, are possibly more obnoxious to health; and there is to be said, further, that any manufacturer who allows them to get abroad loses so much of his product. We hope, then, that Messrs. Wallace will speedily find a means for preventing the escape of both sulphurous acid and sulphuretted hydrogen, and of so conducting their works that their neighbours will make no complaints. The general public think lightly of the value of a large manufactory in a densely-populated neighbourhood, where the employment it affords to a considerable number of workmen is of much importance. Additions to plant will, no doubt, result in increased cost of production, and, in these days of keen competition, such cost may have a fatal influence on business. It now becomes a pressing question as to where what are called noxious processes can be carried on. They are driven every day further and further from our centres of population and are being gathered together outside, in a way which does not promise, in the long run, to promote the well-being of the people. Workmen must follow their work, and as land becomes more and more valuable, the wages class become more and more pressed together.

The Wigan Town Council hoped to share with Manchester in a supply of water from Thirlmere; but the failure of the scheme this session, has set parties to work in the hope of persuading the Council to take a supply from a colliery shaft sunk in the new red sandstone. Water from the sandstone is generally of excellent quality, and that from this particular source seems to offer no exception. The only thing in doubt is the permanence of the supply. We are told that that offered to Wigan and the neighbourhood is inexhaustible, but time might, perhaps, prove the contrary. Failing the success of the Thirlmere scheme in the next session, Wigan may very well have recourse to the colliery shaft for a water supply, which is offered to them at two-pence per thousand gallons less than the Corporation of Manchester proposed to sell Thirlmere water.

The towns meeting at Durham, held under the Borough Funds Act, resulted in a vote authorizing the Town Council to expend public money in opposing the Bill; but a poll was demanded, which will presently be taken, and, unless appearances were deceitful, will result in the triumph of the opposition.



WATER GAS.  
(Continued from p. 946.)

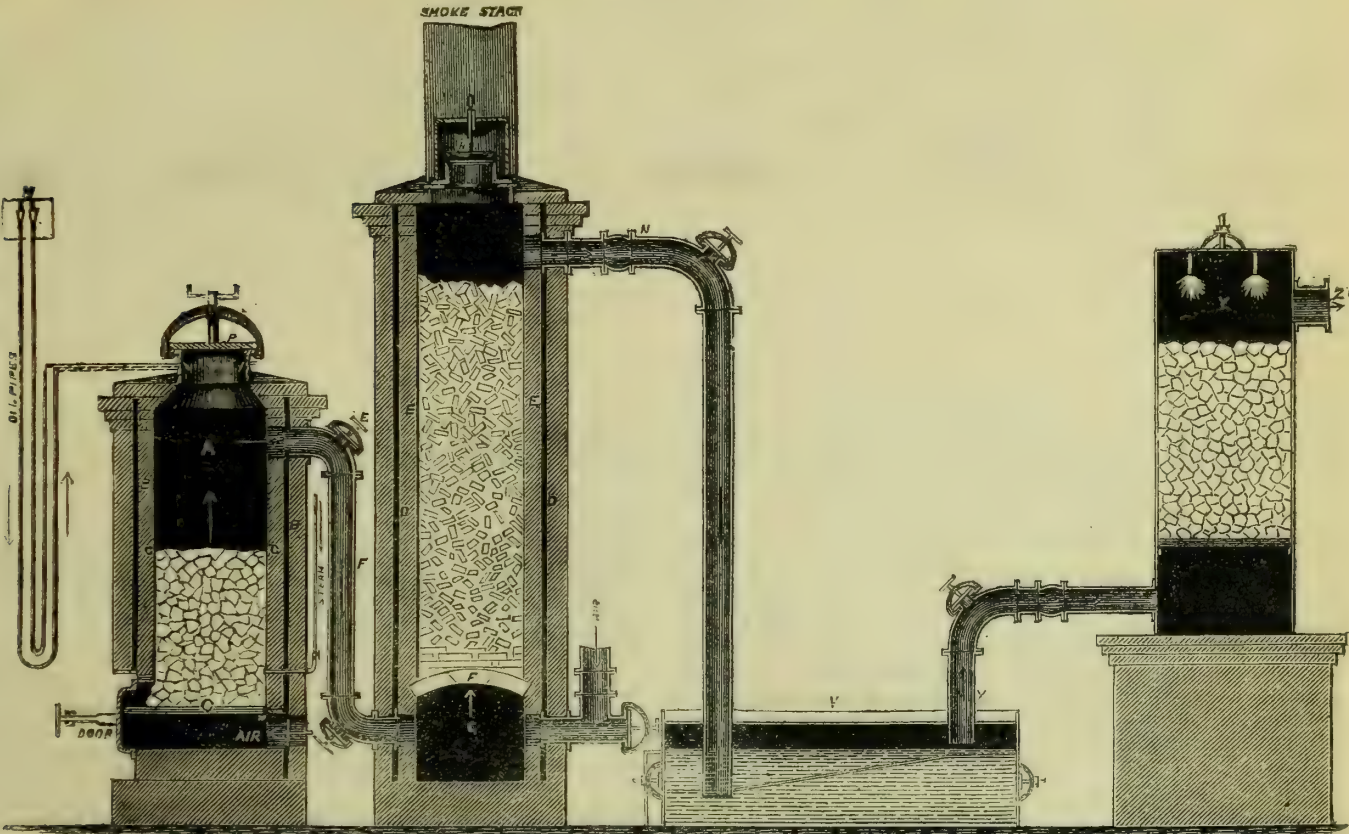


FIG. 5.

For the purpose of indicating the progress that has been made, or at least supposed to have been made, with respect to this matter, we reproduce a drawing of a water gas apparatus by Mr. T. S. C. Lowe, erected at Utica, in 1875, so as to compare it with the apparatus for the same purpose, patented in this country by Messrs. Lowe and Dwight, both of the United States, last January.

In fig. 5, A is the gas generator, 9 feet high and 28 inches internal diameter, half filled with clean anthracite, broken to rather a "large egg size." P is the man-hole for the supply of the same, projecting a little above the second floor or stage of the building on which the attendants stand. The apparatus next on the right is called the superheater, and is 15 feet high, and of the same diameter as the generator, and is, as shown, nearly filled with fire-bricks,

indiscriminately arranged. V is a wash vessel, and Y a scrubber. To set the apparatus to work, the door on the left of the generator is removed, and a fire kindled underneath the coal, so as to fire it at its base. This door is then returned to its place, and fixed something after the manner of a retort-lid. A hot blast is now blown in at the port, marked "air," opposite the door just named. This, of course, intensifies the heat at the base of the coal, and carries the fire rapidly upward, producing intensely hot gaseous products of combustion. These, passing from the generator, A, descend the pipe, F, to the ashpit, G, when, meeting with a blast of the heated air, the combustible portion, carbonic oxide, immediately bursts into flame, and blazing up through the perforated arch, and fire-bricks piled thereon, soon brings the mass of refractory

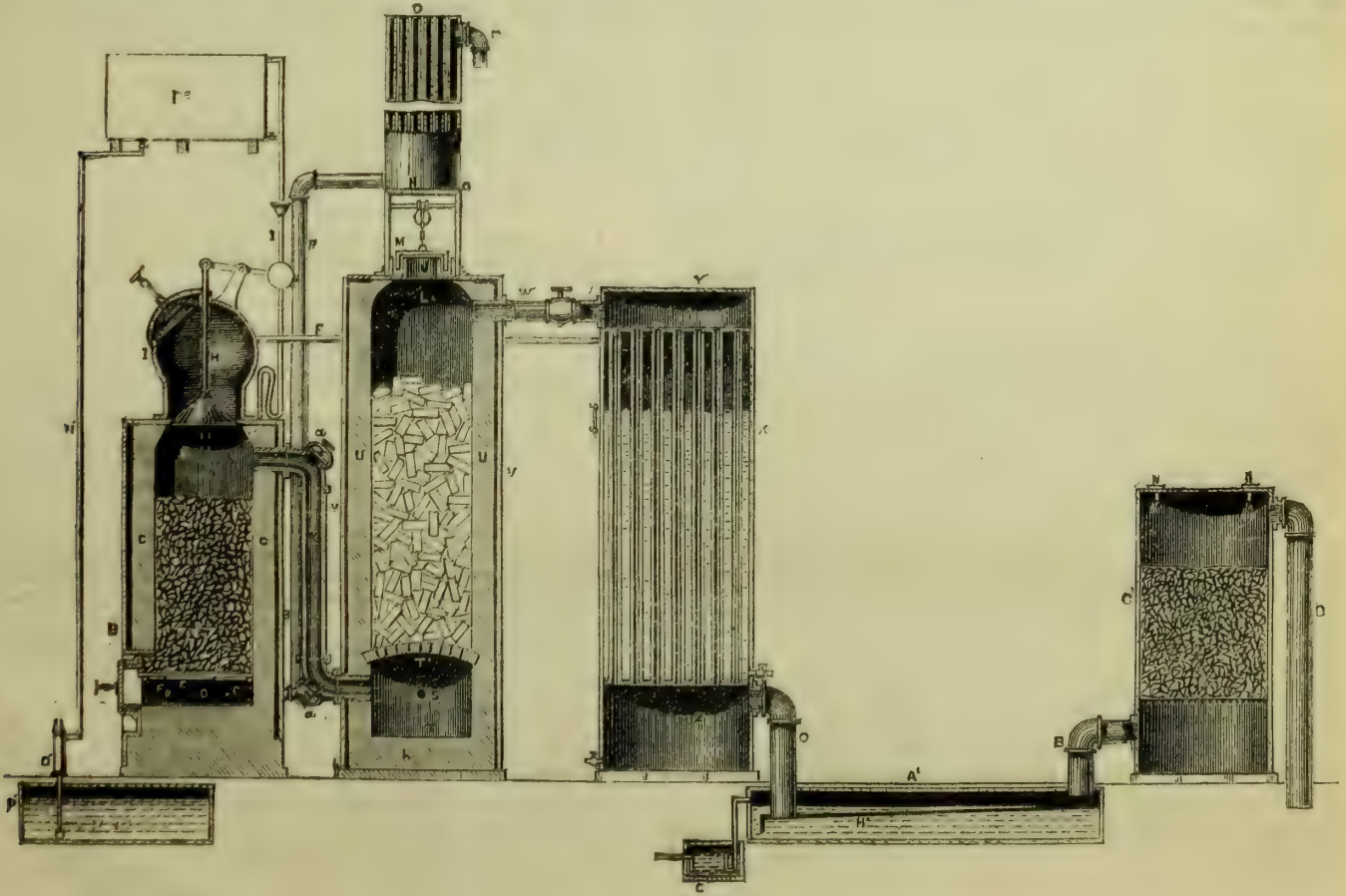


FIG. 6.



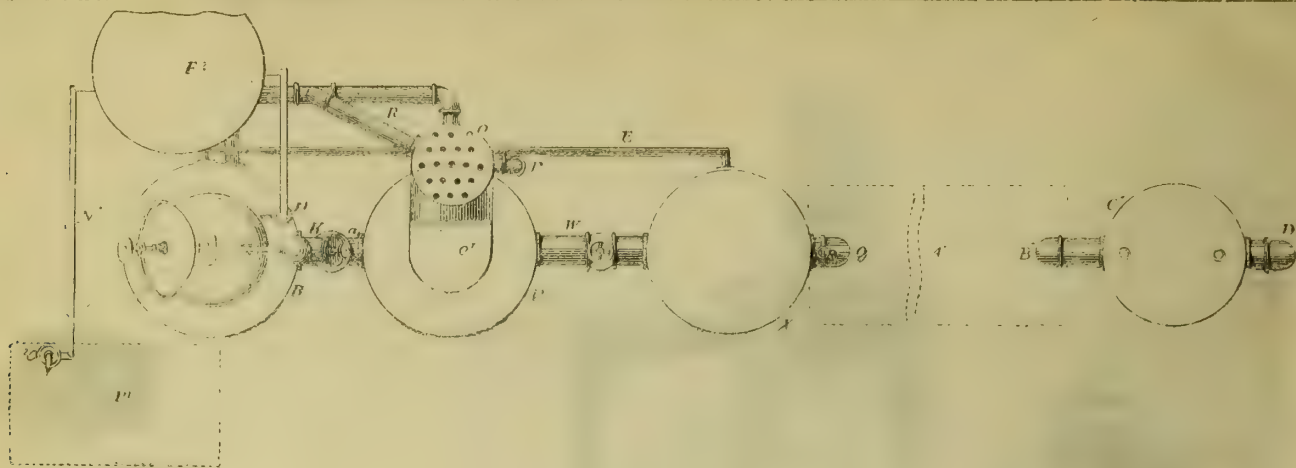


FIG. 7.

material to a very high temperature. The carbonic acid formed during this blowing-up process escapes with the nitrogen at the valve, H, and being intensely hot are conducted to the steam boiler to help in the generation of steam for all purposes connected with the manufacture. The solid carbon in the generator being now in a state of incandescence, and the material in the "superheater" being up to its point of intensity, the process for producing water gas mixed with some hydrocarbon vapour is commenced. The hot blast at both points is now suspended, or turned to another combination, and the valve, H, closed so as to prevent any loss at the "smoke stack." Steam from the pipe on the right of the generator is admitted in this case above the fire-bars into the midst of the incandescent fuel, and not, as usually practised, underneath. The result is the production of hydrogen and carbonic oxide, with a certain per centage of carbonic acid, varying according to circumstances entirely connected with the condition of the carbon in the generator. This gaseous mixture, on leaving the solid decomposing mass in A, mingles with the volume of hydrocarbon vapour generated in the space above, from oil supplied from the vessel, M, through the pipes marked "oil-pipes," on the left of the generator: this superaddition travels with the water gas down the pipe, F, to the ash-pit of the "superheater," from whence it ascends through the highly heated mass of fire-brick, where we presume the carbonic acid that escaped splitting up in the generator is converted into carbonic oxide, at the expense of the vaporous carbon intermixed instead of the solid in the decomposer, A. After this fiery ordeal, the gas passes to the washer, V, and to the scrubber, Y, and so on.

Before passing on to notice the last conception of Mr. Lowe and his associate, we ought to mention that Mr. Lowe does not put a fictitious value on his gas, by stating that it does not require purifying.

The patent of Messrs. Lowe and Dwight that we have already referred to is dated Jan. 14, 1878 (No. 173). This patent is for "Improvements in the process of, and apparatus for, superheating steam, and making heating and illuminating gas." The first part of the specification refers more particularly to the making of water gas for heating purposes. This is a similar apparatus to that we have been describing, *minus* the oil-supplying appendage, but *plus* a special superheater for the steam that is to be subjected to decomposition. As we do not suppose that sets of mains would be laid for the sake of supplying a gas for heat only, and believing that illuminating gas alone is what merits any attention at all, we shall produce that portion of the patent that has been elaborated, by improvements, for that purpose.

Figs. 6 and 7 show an arrangement for producing illuminating gas. The apparatus is just the same as what has, in the first part of the specification, been described for making heating gas only, with the addition of provisions for holding and supplying petroleum or other hydrocarbons.

"When it is desired to put this apparatus into operation a fire is built on the grate, E, in the generator, A, and the cup, M, of the stack, L, is raised out of the liquid seal to allow of the free escape of the waste products of combustion through the brickwork or other refractory material in the stack, L, and up through the tube in the heat restorer, N. Any suitable solid carbonaceous substances (preferably anthracite or bituminous coal or coke, besides which, however, may be mentioned any kind of wood, all kinds of woody rubbish, finely cut straw, coal dust or slack, asphaltum, or any material capable of generating heat) is then gradually introduced into the generator, A. In the meantime a fan blower, or other suitable apparatus, is caused to force air through the pipe, P, into the heat restorer, N, from which a sufficient quantity of warmed or heated air is admitted through the tubes R and G, to cause moderate combustion on the grate surface of the generator, A. As the thickness of fuel increases in the generator, A, and while it is being brought into an incandescent state, the carbonic acid, which is caused by the union of oxygen and carbon at the bottom of the generator, will pass up through the thickness of incandescent fuel, become re-carbonized, and be thus converted into carbonic oxide. This highly inflammable gas, in union with the sulphur of the coal, if that is used, and other impurities thrown off by the heat, leaves the generator, A, through the pipe, K, and is discharged into the combustion chamber, T, preferably heated air at the same time being admitted through the pipe, S, into the same chamber. A flame results, producing an intense heat, which passes up through the openings in the arch, T', and heats to bright redness, or white heat, the entire mass of enclosed open brickwork or other refractory material from bottom to top. In the meantime considerable heat, which ascends through the open tubes of the heat restorer, N, being carried in the waste products of combustion, is absorbed by the air, which is forced in an opposite direction down the heat restorer, around the tubes, and is returned to the lower ends of the generator, A, into the ash-pit, D, and the combustion chamber, T, for supporting the

combustion in the same, thus lessening the length of time and amount of fuel to produce the necessary heat in the different chambers, the waste products of combustion escaping through the opening, J.

"After the mass of fuel, several feet more or less in thickness, in the generator, A, has become thoroughly incandescent, and the refractory material of the stack, L, has become highly heated or white hot, the steam (preferably superheated) is admitted into the generator at the same time that liquid hydrocarbon is admitted into the same in regulated quantities from the tank, F<sup>2</sup>, and into the funnel, I', whence passing in through the curved pipe or pipes, it drops directly on to the hot coals in the generator, A. Here the liquid hydrocarbon is immediately volatilized into a thick vapour, and at this point the highly heated hydrogen, continually emerging from the top of the coals, instantly, and before having time to lose any heat, intermingles with and thoroughly permeates every particle of the volatile carbon, which has the effect of separating and subdividing the particles or globules of carbon, and of surrounding them uniformly with the proper proportion of hydrogen, so that the particles of carbon, not being able to come in contact with each other, are rendered entirely non-condensable, as has been proved by numerous experiments and long experience. These mixed gases pass through the pipe, K, to the bottom of the stack, L, and up through the mass of highly heated refractory material, whereby every portion of the gas coming in contact with the highly heated refractory material is thoroughly fixed. These mixed gases in their highly heated condition are carried off through the pipe, W, at the top of the stack, enter the chamber, Y, at the top end of the boiler, X, where they pass down through the numerous tubes of the boiler to assist in generating and superheating the steam therein. The gases, now considerably cooled, leave the tubes and enter the chamber, Z, and thence through tube Q pass into the washer, A', under the inclined diaphragm, H', under water, in which any soot, dust, or other impurity is deposited. From the washer the gas next enters the lower end of the scrubber, C', and after passing up through the contents thereof, is conveyed through the tube, D', to the holder or other point of storage, or directly to any place of consumption.

"While generating gas as before described, a test burner will readily indicate the quality or candle power of the gas being produced, and the requisite carbon or hydrogen can be easily regulated by regulating the quantity of liquid hydrocarbon, or of steam, admitted to the generator, A.

"Whenever it is desired to restore the heat to the fuel in the generator, A, and in the stack, L, the liquid hydrocarbon and steam are both shut off, the closely fitting lid, I, is removed, the valve, O', is opened, and the mixed gases in the generator and in the stack are allowed to burn in the atmospheric air, which, unless this was done, would become explosive on the re-application of the air. The valve, O, is opened, and fuel is then added, if necessary, through this opening. The lid is then properly secured, air is again forced into the ash-pit, D, and combustion chamber, T, as before described, and a few minutes of time suffice to bring both the generator, A, and the stack, L, to the required heat, after which a large amount of hydrocarbon gas is again produced as before.

"When a steady flow of gas is desirable, two sets, or more, of generators may be employed, according to the requirements."

(To be continued.)

#### THE PRESERVATION OF IRON.

A new process for protecting iron surfaces from oxidation has been patented by Mr. George Bower, the well-known Engineer and Contractor of St. Neots. This process depends, like that of Professor Barff, on the formation of an unalterable magnetic oxide of iron (Fe<sub>3</sub>O<sub>4</sub>), but the means by which this desirable end is accomplished are in every way very different.

Before laying before the readers of the JOURNAL OF GAS LIGHTING the details of the process, it will be well to remind them of the objections to the various methods at present in vogue for preventing rust. The most general plan, and, indeed, the only plan at all applicable to the protection of what may be termed "structural" iron, is to give it a coating of some kind of paint or composition, that will, as it were, form an envelop over the iron, and so protect it according to the impermeability of the envelop. Now, such a coating has a purely mechanical adhesion to the surfaces to which it may be applied, and is consequently readily abraded by very slight friction, and is also liable to scale off on exposure to atmospheric influences, thus involving frequent renewal and consequent expense. This does not, however, constitute the only objection to the use of paints, &c., as a far more serious one arises from the tendency of iron to "granular" rusting, which may be considered to be a progressive action which takes place with iron if oxidation be started at any one place, tending, of course, seriously to weaken any structure composed of that metal. Why paints, then, are objectionable will, in view of this fact, be tolerably evident; for if rusting has begun at some small point of the ruptured surface, it spreads laterally under the paint, which then simply serves to hide a defect which ought at once to be remedied. Iron articles for many purposes are frequently coated with some less oxidizable metal, as tin or zinc. If the former metal is used, the product is known as tinned iron, or "tin-plate;"



and if the latter, it is termed "galvanized." This method of protection, for small articles especially, is valuable and efficient, so long as the continuity of the zinc or tin film be not destroyed; but if it should be, the action set up between the tin or zinc and iron accelerates very materially the destruction of the metal.

For many years past it has been well known to chemists that if it were only possible to give metals a coherent and permanent coating of their own oxides, in many cases further destruction of the metal would be stayed. As it is, many of the metals largely used for articles likely to be exposed to ordinary oxidizing influences depend, for their adaptability to such purposes, on the film of oxide which forms on their surfaces and so protects them from further action. We see this fact well exemplified in the case of lead and zinc.

Iron, however, presents the difficulty, already referred to, of being susceptible of progressive rusting, in the case of the red oxide which forms on its surface if exposed, at the ordinary temperatures, to the influences of moisture and atmospheric oxygen. If, however, we come to examine the matter a little more closely, we find that there is an oxide of iron known to chemists as the magnetic or ferrous-ferri oxide that is unalterable, and requires an elevated temperature to produce it.

This oxide, then, seems at once to solve the difficulty, and, as a matter of fact, the Russians, as pointed out by Dr. Percy, in his interesting paper before the Iron and Steel Institute, have been using this very substance for many years as a protective from further oxidation. The coating they form, however, is very superficial, and their method of procedure defective, and inapplicable to most articles.

It is well known to every beginner of chemistry that, if steam is passed over red-hot iron, the steam is decomposed, hydrogen being set free, whilst the oxygen goes to the iron to form the stable magnetic oxide of iron ( $\text{Fe}_3\text{O}_4$ ). On this reaction depends the process of Professor Barff, who, as is well known, places his articles in a heated chamber, and then passes in superheated steam for a time, dependent, of course, on the thickness of the film required. Mr. Bower has, however, discovered a process that will most efficiently coat the iron, and which immensely simplifies the whole method of procedure. The agent he employs is the oxygen of the atmosphere around, and the entire process is a marvel of simplicity. The articles are simply placed in a chamber constructed of fire-brick or iron, and fitted with inlet and outlet pipes; air is passed in, and the chamber closed as completely as possible. The temperature is raised to the requisite degree, which varies with the nature of the articles, and ranges from a dull to a bright red heat. The chamber is kept closed for one hour, when the air is renewed and the chamber again closed, and in this way, at the end of every hour or so, a fresh supply of air is allowed to fill the chamber, until the required thickness of oxide is formed, which will, of course, depend on the ultimate use for which the articles are designed. The cost of thus protecting iron depends simply on the amount of fuel used, with labour and wear and tear of apparatus involved, so that the process has the advantage of being literally the cheapest, as well as the most effective, yet brought before the public.

The air supply may be derived either from an ordinary gasholder, or by connecting the outlet-pipe with the draught of the chimney-shaft, in connection with the furnace heating the chamber.

The coating has been most severely tested, both as to hardness, homogeneity, and capability of withstanding all the ordinary oxidizing influences likely to be brought to bear on it, and has not been found wanting, but has received the highest eulogium from those who have had an opportunity of testing the process.

The colour of the coating produced being of a peculiarly delicate tint, and varying between a light and a dark grey, or neutral tint, absolutely dispenses in a large number of cases with the use of further ornamentation by painting, &c. The process deserves especial encouragement, when it is recollected how enormously it must enhance the value of iron as a constructive material, and also facilitate its application under circumstances which at present forbid its use.

## Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

### SALES OF GAS ACTS, 1859 & 1860.

SIR,—A short time since I promised to make some further communication about these Acts, and now, if you will kindly permit me, I will redeem my promise.

The Act of 1859 provides as follows:—

"That after the passing of the Act the only legal standard or unit of measure for the sale of gas by meter shall be the cubic foot, containing 62·321 lbs., avoirdupois weight, of distilled or rain water, weighed in air, at the temperature of 62° of Fahrenheit's thermometer, the barometer being at 30 inches.

"That within three months after the passing of the Act, models of gasholders measuring such cubic foot, and the multiples and decimal parts thereof, with proper balances, indices, and apparatus for testing the measurement and registration of meters, together with stamps of a uniform design for stamping the same, shall be made and verified under the direction of the Lord High Treasurer, and be deposited with the Comptroller-General of Her Majesty's Exchequer, at Westminster, the Lord Mayor of London, and the Chief Magistrates of Edinburgh and Dublin, and with the Chief Magistrates of such other cities and boroughs as the said Lord High Treasurer shall direct.

"That within nine months, certain Local Authorities (hereafter named) shall provide copies of the said gasholders, apparatus, &c., for testing meters, with stamps for stamping the same, and shall appoint a sufficient number of Inspectors, and allot to each Inspector a separate district for carrying into effect the provisions of the Act."

These authorities are—

"For England: The Justices of the Peace, in quarter sessions assembled,

of every county, riding, division, county of a city, or county of a town, and the Town Council of any borough, if within six months they decide, in manner prescribed, to adopt the Act.

"For Scotland: The Justices of the Peace, at a meeting to be called for the purpose by the Sheriff of each county, and the Magistrates of each royal burgh; but the Justices and Magistrates may unite and form one district for the whole county.

"For Ireland: The Town Council or Town Commissioners of every borough and town, and where any gas district extends beyond the district of such town or borough, the Town Council or Town Commissioners are to put the Act in operation over all parts of the gas district.

"In all towns and boroughs where the Town Council or Town Commissioners are manufacturers and sellers of gas, the Act is to be put into operation by the Justices of the Peace or Grand Jury, as the case may be, instead of by the Town Council or Town Commissioners.

It is provided—

"That nothing in the Act shall extend to compel any Town Council in England, or royal burgh in Scotland, except such as are county towns, wherein gas is used, to provide copies of the said gasholders, apparatus, &c.

"That no meter duly stamped under the Authority of the Act shall be liable to be re-stamped, although the same be used in any other place than that at which the same was originally stamped.

"That after twelve months, no meter shall be fixed for use unless the same shall have been stamped by an Inspector appointed under the provisions of the Act.

"That after the expiration of ten years, no meter shall be used for measuring gas unless the same shall have been stamped as aforesaid.

"That any person, upon conviction, shall forfeit a sum not exceeding £5 for fixing any unstamped meter for use after twelve months as aforesaid, or for using any unstamped meter after ten years as aforesaid, and that any contract, bargain, or sale made by any unstamped meter, after the ten years, shall be void."

It was, therefore, as respects England and Scotland, made obligatory upon every county, riding, division, county of a city, or county of a town, "to put the Act in operation;" but left optional for towns not being county towns to do so or not as they saw fit; but, as counties included all places that did not "put the Act in operation" for themselves, it followed that, whether towns did so or not, the Act was in effect obligatory upon all places in England and Scotland; and, as respects Ireland, it was obligatory upon all towns and boroughs to adopt it, and power was given to them to extend to places adjoining, but no power was given to the counties, either permissive or otherwise.

When the Act was passed the verification of the gasholders, apparatus, &c., for proving the meters was placed under the direction of the Astronomer Royal, and so much time was occupied in making them of the degree of precision which he thought necessary, that it was found impossible to put the Act in operation by the time named; hence it became necessary to have another Act in the following session to alter the date, and when that was introduced the following provision, for the reasons hereafter explained, was inserted:—

"That, notwithstanding anything in the said Act contained, the said Act shall not come into operation, in any county of England, until the Magistrates of such county, in quarter sessions, or in any county in Scotland until the Commissioners of Supply of such county, or in any county of Ireland until the Grand Jury of such county, shall have resolved to bring such county under the operations of the Act."

The object of the original Act was undoubtedly to prohibit the use, after a given time, of any meters for the sale of gas that had not been stamped, and as the promoters said that every meter had to be taken down for repair in the course of every eight or ten years, the period of ten years was fixed upon, that the change might be made without any additional expense to the company, or inconvenience to the consumer.

The provisions for putting the Act of 1859 in operation were the best that could have been made for that purpose; but, nevertheless, they would, in their own way, have carried out the object of the Act; and if that had never been altered, the supplying of gas through an unstamped meter would at the present time have been illegal in all parts of England and Scotland; but, by repealing the obligation upon the counties to adopt the Act, it has become illegal in some places and not in others, and the public have no direct means of knowing where it is illegal, and where it is not.

Under the powers of the Act, a county could only put it in operation to the extent of its own jurisdiction, and a city or town could do no more; consequently, if a city or town were to adopt it, and the county in which such city or town was situate were not to do so, one part of the county would be subject to the Act, and not the other part; and a gas district, whether supplied by a Company or a Local Authority, might be subject to the Act in one part, and not so in the other. The same thing would also occur if one county adopted the Act and not the adjoining county. Gas districts, as a rule, have no relation to either county or municipal limits.

As by the original Act the counties in England and Scotland were obliged to adopt the Act, and the counties included all places that were not otherwise provided for, the power conferred upon the towns and boroughs of Ireland to extend the Act, in certain cases, to places beyond their own limits, was not required for the cities and towns of England and Scotland; but when the counties of England and Scotland were relieved of the obligation to adopt the Act, the cities and towns in England and Scotland were placed in precisely the same position as the towns and boroughs of Ireland, and, to make the Act effective, should have had the same powers.

In the absence of any provision to that effect, or for authorizing the counties and cities to unite and form one district, as in Scotland, places lying beyond the statutory limits of any city or town are, if the counties do not resolve to put the Act in operation, left wholly unprotected, although they may be, to all intents and purposes, part of such cities or towns. Neither the Act of 1859 nor 1860 contains any express provision as to how the public are to know whether the County Justices have resolved to bring the county under the operation of the Act or not. The Act of 1859 provides that the Justices of the Peace for the county, in quarter sessions assembled, shall, within nine months after the passing of the Act, do the following things, viz.:—

"Provide copies of the models of gasholders, apparatus, &c., for testing the meters, and stamps for stamping the same.

"Fix the places at which such models and stamps shall be deposited.



"Appoint a sufficient number of Inspectors of Meters for the safe custody of such copies and stamps, and for the discharging of the other duties imposed by the Act.

"Allot to each Inspector a separate district, and distinguish each such district by a number or mark, and have that number or mark affixed to the stamp."

If the Justices of the Peace for the county have not done these things, it may be concluded that they have not resolved "to bring the county under the operation of the Act," and accordingly that the Act does not apply to any part of that county outside the statutory limits of any city or borough that may have adopted it for its own district.

While the Act was passing, the public took but very little interest in it. Many of the Justices in the counties knew nothing about it until the time came for putting it in operation, and then some of them—especially those in the rural districts—objected to doing so on account of the expense, and raised a great outcry in opposition. They represented to the authorities that, as nearly all the stamping would have to be done in the cities and towns, it was only in those places that the fees for stamping could have any chance of covering the expenses, and as it was only the inhabitants of such places who could be benefited by the Act, they ought to bear the expense of putting the Act in operation themselves. And further, that if the counties adopted the Act, they could not prevent the cities and towns from doing so too, if so disposed; and thus, after incurring a large expense, they might be left with only the outside places, where there might be but very little gas used, or perhaps none at all to provide for. That under such circumstances, it would be very unjust to the counties to compel them to adopt the Act, and they ought to be allowed a discretion to adopt it or not, as they saw fit.

These arguments, it may be presumed, had some influence with the authorities, as, when the Act for altering the date was introduced, the obligation upon the counties was repealed, and a discretionary power conferred upon them instead.

It was no more than just to the counties, under the circumstances, to relieve them from the very unsatisfactory position in which the Act had placed them, but the relief was given in the wrong way.

All cities and towns are large consumers of gas, and even when the Act was first brought in, many of them were "manufacturers and sellers of gas," while it was certain that many more would become so year by year, whereas counties never could become "manufacturers and sellers of gas" or, to any large extent, consumers.

The amending Act, therefore, ought to have repealed the powers conferred upon the cities and towns, and not those upon the counties. Had the counties been made, as they ought to have been, the sole authorities for putting the Act into operation, instead of the cities and towns, as prescribed by the Act, with power to form districts among themselves, as in the Highways Act, they would doubtless have selected the most suitable localities for the purpose, and have prevented much unnecessary expenditure, by avoiding the useless multiplication of places, and thereby have made the fees cover a very large portion, if not the whole, of the working expenses. And what, perhaps, is of more importance than anything else—the testing and stamping of meters—would then have been, as they ought to be, under the control of independent parties, as between the buyer and seller, and not, as they now too often are, entirely in the hands of the seller.

In the Metropolis, which is frequently referred to as a guide in these matters, the Vestries and Local Boards are the consumers of gas, but the Metropolitan Board of Works—an entirely different body—have charge of the proving and stamping of meters.

When the original Act was first drawn, the promoters had no knowledge, and no means of acquiring knowledge, as to what the necessities of the case were likely to be; but now, when the Act has been in operation for 15 years, very accurate information can be obtained by the authorities as to what the necessities of the case really are, and the whole machinery might be re-arranged so as to make certain that the fees in all cases covered the expenses.

Meter makers have all their meters, whether new or repaired, stamped before they send them in to the companies, and must of necessity do so; and, for their own convenience, they send them to the testing-place nearest their own premises. Probably there are many more meters made in London than in all the other parts of the country together—England, Scotland, and Ireland—and, doubtless, all those made in London are stamped in London, although they may be used in all parts of the country. It might, therefore, be that, while a testing-place in the Metropolis was a source of large profit, those in many country places were heavy losses. But I have no knowledge of the facts, and cannot, therefore, say for certain how the facts really are. It is, however, abundantly evident that the work done at a testing-place is not governed by the number of inhabitants of the district, but by the accident, as it were, of a meter maker in large business being located in the neighbourhood.

Some companies repair their own meters, and would, no doubt, like to have a testing-place close at hand; but, if companies choose to take upon themselves the business of meter makers, they must do so with all its attendant casualties, as there is no reason why they should have any advantages over others engaged in the same occupation.

Every gas company, whether under statutory powers or not, ought to be compelled to have a model gasholder apparatus, &c., on their own premises, and all cases of disputed registration ought to be tried there first, in the presence of the consumer himself, or any one whom he may depute to represent him, but subject to the right of either party to appeal to the nearest testing-place, on condition of paying the cost in the event of the final decision being given against him.

All the work, therefore, that need be done at a testing-place is the proving and stamping of new or repaired meters. Occasionally there might be an examination for a disputed registration, as before explained; but even with this, it is evident that, with the present railway accommodation, a very few places would suffice for this work.

Any large town, on the borders of a county having a testing-place, might act for the district all round, irrespective of county boundaries.

The Act is full of very serious defects, so much so that any attempt to amend it would only make matters worse; it ought to be wholly repealed, and another, with an entirely new set of regulations, passed

instead; and the new Act ought to contain a clause to prohibit absolutely the use of unstamped meters either in England, Scotland, or Ireland, which might be done without injustice to any one.

W. LIVESKY.

Gas and Water Companies Association, 6, Victoria Street,  
Westminster, June 19, 1878.

### BIRMINGHAM GAS APPARATUS EXHIBITION.

SIR,—Below I send you particulars of admissions at the Gas Apparatus Exhibition, recently held in Birmingham, which I hope may be useful to others who propose to organize such Exhibitions:—

Exhibition.		Admission.	
Wednesday . . . . .	2 to 5 p.m.	2s. 6d. . . . .	333
Do. . . . .	5 to 10 p.m.	1s. . . . .	751
Thursday . . . . .	11 a.m. to 5 p.m.		
Do. . . . .	5 to 10 p.m.		
Friday . . . . .			
Saturday . . . . .			
Monday . . . . .	11 a.m. to 5 p.m.	6d. . . . .	4,852
Wednesday . . . . .			
Thursday . . . . .			
Friday . . . . .			
Saturday . . . . .	5 to 10 p.m.		
Monday . . . . .			
Tuesday . . . . .	11 a.m. to 5 p.m.	3d. . . . .	10,703
Wednesday . . . . .			
Thursday . . . . .	5 to 10 p.m.		
Total . . . . .			16,639
Cooking Lessons.			
High-class cooking, five lessons, admission 6d. . . . .			256
Plain household cooking, six lessons, free . . . . .			897
Artizan cooking, ten lessons, free . . . . .			3,233
Total . . . . .			4,386

EDWIN SMITH, Secretary.

Corporation Gas Department.

Offices: Old Square, Birmingham, June 21, 1878.

### STAFFORD GAS-WORKS PURCHASE.

SIR,—Your JOURNAL of the 18th inst. contains the information that the Stafford Gas Company have sold their concern to the Corporation for £70,000, and have left the question of recompense to the Manager, for loss of office, to the tender mercies of the Shareholders, who may, or may not, "privately raise a testimonial."

It would interest some of your readers to know why Stafford does not come under the operation of clause 309 of the Public Health Act, 1875.

The spirit of that clause certainly infers that a fair compensation is due to the ex-Manager, but if the "letter of the law" does not give it, I respectfully submit to the consideration of our legislators that the law should be amended.

A COUNTRY MANAGER.

[The compensation provided for under section 309 of the Public Health Act is clearly not intended for officers of a Gas Company displaced by the transference of the undertaking to the Local Authority, but for public officers serving under superseded local Acts. The misfortune at Stafford is that, by section 51 of the Stafford Corporation Act, 1876, the Gas Company are made trustees for the purchase-money received for the sale of their works, to distribute the whole of it among the Shareholders, and they have no power to appropriate one shilling in the way of compensations. Seeing, however, that the Shareholders will thus receive sums equal to 29½ years purchase of statutory dividends, it will be very ungracious on their part if they do not willingly and promptly contribute the amount which the Directors, in the first instance, proposed to set aside for this purpose.—ED. J. G. L.]

### SEWAGE GAS.

SIR,—I find on reading over my letter in your JOURNAL, on sewage gas from "Wrexham sewage sludge," that there is an error in the quantities of gas per ton.

I should be obliged if you will correct the same as follows:—

Purified gas, per ton . . . . . 4669 cubic feet.

Unpurified gas, per ton . . . . . 5696 "

You will see that a decimal point had been introduced.

T. A. COLLINGE, Analyst.

Rochdale, Corporation Gas-Works, June 22, 1878.

[On examination we find that the error was in our Correspondent's copy.—ED. J. G. L.]

## Parliamentary Intelligence.

### HOUSE OF LORDS.

MONDAY, JUNE 17.

The following Bills received the Royal Assent:—Gas and Water Orders Confirmation; Local Government Provisional Orders (Droitwich, &c.); Islington Local Board Water; Burton-upon-Trent Commissioners Gas; Clitheroe Gas, Water, and Improvement; Cockermouth and Workington Water; Dalton-in-Furness Local Board; East Grinstead Gas and Water; Hemel Hempstead District Gas; Nottingham Improvement (Gas, &c.); Scarborough Corporation Water; South Hants Water; Southport Water; Tredegar Water and Gas; West Houghton Local Board.

Bradford Water and Improvement Bill,—read the third time, with the amendments, and passed.

Stoke-upon-Trent Corporation Gas Bill,—read the third time, with the amendment, and passed.

TUESDAY, JUNE 18.

Cardiff Water Bill,—reported with an amendment.

Drumcondra, Clonliffe, and Glasnevin Township Bill,—read a second time, and committed.

Newry Gas Bill,—Commons amendments considered, and agreed to.



THURSDAY, JUNE 20.

Maryport Improvement Bill,—reported with amendments.  
Hamilton Burgh Bill,—read the third time, with the amendments, and passed.

FRIDAY, JUNE 21.

Limerick Corporation Gas Bill,—reported with amendments.  
Grand Junction Water Bill,—reported without amendment.  
Cardiff Water Bill,—read the third time, with the amendment, and passed.

Cheltenham Corporation Water Bill,—referred to a Select Committee, consisting of Earl Powis (Chairman), Lord Carysfort, Lord Heytesbury, Lord Truro, and Lord Norton; to meet on Monday, June 24.

PUBLIC HEALTH ACT (1875) AMENDMENT BILL.

On the report of amendments to this Bill,  
Earl DE LA WARR announced that when the third reading came on, he would take the opinion of the House on the measure.

The Earl of KIMBERLEY said he should propose the third reading on Tuesday, June 25.

After some verbal amendments, the report was received.

HOUSE OF COMMONS.

MONDAY, JUNE 17.

Newry Gas Bill (Lords),—read the third time and passed, with amendments.

TUESDAY, JUNE 18.

South Staffordshire Water Bill (Lords),—reported with amendments.  
Exeter Gas, Castleford and Whitwood Gas, Normanton Gas, Forfar Water, and Warrington Water Bills (Lords),—referred to a Select Committee, consisting of Mr. Stansfield (Chairman), Mr. Simonds, Mr. Wethered, and Mr. Swanston; to meet on Tuesday, June 25.

THURSDAY, JUNE 20.

The Examiners reported that the Standing Orders not previously inquired into have been complied with in the case of the Mansfield Commissioners Gas Bill (Lords).

Leicester Corporation Bill (Lords),—as amended, considered; amendments made.

FRIDAY, JUNE 21.

Stoke-upon-Trent Corporation Gas Bill.—Lords amendments agreed to.  
Lichfield Gas Bill (Lords),—as amended, considered; clause added; amendments made.

Trowbridge Water Bill (Lords), as amended, considered.

## Legal Intelligence.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

WEDNESDAY, JUNE 19.

(Sittings in Banco before the LORD CHIEF JUSTICE and Justices MELLOR and LUSH.)

THE QUEEN, ON THE PROSECUTION OF THE BOARD OF WORKS FOR THE WANDSWORTH DISTRICT, v. WALLACE.

Mr. MORGAN HOWARD, Q.C., and Mr. F. J. SMITH were for the prosecution; Mr. GRANTHAM, Q.C., and Mr. WALLACE for the defendants.

In this case the defendants, who are the proprietors of the chemical works at Battersea, were indicted at the Surrey Assizes, in 1877, before Justice Grove, for a nuisance created by them in the manufacture of sulphate of ammonia and sulphuric acid. The Jury, however, were unable to agree, and were therefore discharged. The case was tried again at the last Spring Assizes at Kingston, before Lord Coleridge (see JOURNAL, Vol. xxi., page 555), when the defendants pleaded guilty, it not being denied that, as the works had been conducted, there had been a nuisance, the defence being that, by certain changes in the process, the nuisance had been abated. The complaint originally made against them was that, in carrying out their operations, they used sulphur and the refuse liquids obtained from gas-works, and it was represented that the fluids and gases evolved in the works were not only offensive, but noxious and injurious to health. It was stated that the liquid discharged into the sewers was so noxious as to cause the death of one of the men engaged in the sewers, and that the gases which escaped from the sewers injured the health of the inhabitants. At the last sittings of the Court the plaintiffs prayed for judgment, whereupon the defendants applied for leave to file affidavits showing that the nuisance had been abated. The application was opposed on the ground that the nuisance was so great, and the necessity for repressing it so urgent, that no delay ought to be allowed. Upon this one of the Masters of the Court (Master Brewer) was sent down to inspect the premises, and he reported to the Court that, at all events as the works were then conducted, there was no such serious nuisance as was described, and no such urgent necessity for a remedy. Upon this the case was postponed to allow time to the defendants to file affidavits showing that the nuisance had been abated by the means which had been adopted, and a large number of such affidavits had accordingly been filed, and there was an equally large number on the other side to show that the nuisance had not been abated, but still existed. The question upon these affidavits was whether the means adopted since the prosecution was instituted had or had not in substance abated the nuisance, and upon that question the affidavits were contradictory and equally numerous on both sides.

On the present occasion the prosecution again moved for judgment, and numerous affidavits were read in support of the motion, and in mitigation. On the part of the prosecution there were 37 affidavits, representing 76 deponents, several of them joining in the same affidavits. Of these, six were medical men in the neighbourhood, two were chemists of eminence—Mr. Keates and Mr. Dupré—and the rest were inhabitants of the neighbourhood. On the part of the defence there were 45 affidavits, representing 82 deponents, of whom six were medical men in the neighbourhood, three were chemists of eminence—Dr. Voelcker, Dr. Wright, and Mr. Manning—and the remainder were inhabitants of the neighbourhood. Some of the medical men had made depositions on both sides, having originally given evidence at the first trial on behalf of the prosecution to show that the works as they had been carried on were a nuisance, and having since then made affidavits on behalf of the defendants to show that the nuisance had been abated by the means which had since been adopted. These means were fully described in the affidavits for the defence; but they applied, it should be observed, only to the manufacture of sulphate of ammonia, not to the manufacture of sulphuric acid. The affidavits for the prosecution, however, applied to both manufactures, though that of the sulphate of ammonia, made from the ammoniacal liquor, appeared to be the worse. The affidavits stated that sulphuric acid was made from sulphur, the effluvia from which resembled that by the burning of a great quantity of lucifer matches, and produced choking sensations in the throat, tending to cause inflammation of the eyes, inflammation of the mu-

cous membrane of the throat, ulceration in the throat, &c. In the manufacture of sulphate of ammonia it was stated that quantities of ammoniacal liquids at high temperature—very often as high as 170° or 180°—were discharged into the sewers, whence arose "clouds of steam," charged with sewer gas, and not only abominably offensive, but most injurious to health. One witness stated that a silver watch he had was quite blackened, and there were affidavits to show that the men in the sewers could not exist, and one of them had, as already stated, actually been killed in the sewers. The smell, it was said, was that of "sulphuretted hydrogen," which was like that of a great quantity of rotten eggs, and it was described as abominably offensive. Filthy smells, it was said, pervaded the whole neighbourhood and produced such nausea that the inhabitants were obliged to keep their windows closed, and this even on Sundays, thus depriving their houses of ventilation; and even in the churches the windows had to be closed. Moreover, medical men stated that, to their knowledge, the health of the inhabitants was affected, and they gave instances of illness caused by the nuisance. These affidavits, it should be stated, applied not only to the period between the prosecution and the trial, but from the trial in March last down to the last month, the month of May, and even down to the present month. In the course of the reading of the affidavits for the prosecution, the medical men stating cases of actual illness caused by the nuisance,

The LORD CHIEF JUSTICE interposed, and asked: What possible answer can be made to these affidavits? There are instances of actual illness caused by the nuisance; and if that be so, it is utterly impossible to justify the nuisance.

Mr. GRANTHAM said that he had as many affidavits on the other side.

The LORD CHIEF JUSTICE: Affidavits of persons who have not smelt the nuisance which the others have smelt. From my own chemical knowledge, I should say that you cannot manufacture these things without producing these noxious fumes.

Mr. GRANTHAM: That is true.

The LORD CHIEF JUSTICE: Then, how can you get rid of the fumes?

Mr. GRANTHAM: That is the difficulty, no doubt; but we say that the means we have adopted have done away with the nuisance—by means of sealed pipes and tanks, and passing the liquid through charcoal. The ammoniacal liquor, the refuse of the gas-works, must be got rid of somehow. The defendants take 17,000 gallons of it a day from one company's gas-works, and 17,000 gallons a day from another, and, no doubt, the liquor evolves offensive effluvia; but every means have been adopted to neutralize them. The defendants have offered to conduct their works under the inspection of the Medical Officers of the Board of Works.

The LORD CHIEF JUSTICE: That is, on the supposition that the works can be conducted so as to avoid a nuisance.

Mr. GRANTHAM: No doubt; but the defendants have done all they can, and have spent £6000 in a few months. The affidavits on their part show that the means adopted have done away with the nuisance.

The LORD CHIEF JUSTICE: Mr. Morgan Howard, are you satisfied, on the part of the prosecution, that the nuisance has been abated?

Mr. HOWARD: Certainly not, my lord; on the contrary, our affidavits show that the nuisance is as great as ever, and one of the affidavits, made by the Curate of the parish, was made the day before yesterday.

Justice LUSH: It is for the defendants to satisfy us that the nuisance has been abated.

Mr. GRANTHAM: No doubt; and we say that our affidavits are sufficient to satisfy the Court of it, and they are in accordance with the Master's report.

Justice LUSH observed that it might be that, on a particular occasion, at a particular time, the nuisance might not have been observable.

Mr. HOWARD said the defendants knew or suspected that some one was coming down, and, no doubt, put a stop to the works. There were 250,000 gallons of this foul liquor to be disposed of at these works every week, and it stood to reason that they could not be disposed of without causing the nuisance. The last suggestion was that the liquor should be absorbed in the earth, thus infecting all the wells and springs of the neighbourhood.

The LORD CHIEF JUSTICE: The truth is, that the works ought not to be carried on in such a place in the midst of a populous neighbourhood. How do the defendants say that they have altered their process?

Mr. GRANTHAM: By cooling the effluent liquor, and absorbing the effluvia.

Mr. HOWARD said, at the first trial, Justice Grove pointed out that although chemists in their laboratories might, on a small scale, carry out processes which neutralized effluvia, such processes could not be carried out effectively by common workmen, on a large scale, in extensive works.

The LORD CHIEF JUSTICE: If you generate sulphuretted hydrogen, it must escape somewhere.

Mr. GRANTHAM: Unless it is consumed, and we say our affidavits show that it is consumed.

Mr. HOWARD stated that upwards of 1000 of the inhabitants had memorialized the Board against the works.

Mr. GRANTHAM read some of the affidavits for the defendants to show that under the existing process the temperature of the effluent liquor was nearly 100° less than before—that is, 88° instead of 180°, and that there was nothing in the effluvia detrimental to vegetation or health.

Mr. HOWARD pointed out that the chemical witnesses showed that sulphuretted hydrogen was not inimical to vegetable, but to animal life, and it was the sulphuric acid which was injurious to both animal and vegetable life; and the chemical witnesses for the defence did not deal with the sulphuric acid. Moreover, there were affidavits of witnesses who were at the works in June, showing that the nuisance was as great as ever it was.

Justice MELLOR observed that if there was such difficulty in preventing the nuisance, that only showed that the works ought not to be carried on in such a neighbourhood. The law was now settled that it was not a defence to a charge of nuisance that the inhabitants had come to the neighbourhood; they were equally entitled to enforce the law against it.

Mr. GRANTHAM again urged that the improvements his clients had made had been successful in obviating all nuisance.

Justice MELLOR: When were they completed?

Mr. GRANTHAM: In April.

The LORD CHIEF JUSTICE: How far do the affidavits for the prosecution bring down the existence of the nuisance?

Mr. HOWARD: To the day before yesterday. There were three affidavits on Friday last, and one the day before yesterday. One of the medical witnesses states that sulphuretted hydrogen is a poisonous gas, and even when diluted with air causes sickness. The other affidavits trace the nuisance down to the end of May in an abominable and aggravated form; and then there are these additional affidavits within the last few days. The Board have given the defendants every possible delay in order to allow them, if they could, to abate the nuisance, and it still exists in as bad a form as ever. The affidavits show that the nuisance exists by night and by day—on Sundays as well as on week days.

Mr. GRANTHAM, on the other side, urged that the measures adopted by the defendants had been completely successful.

The learned Judges having conferred together,



The LORD CHIEF JUSTICE said: We are not quite satisfied as to whether this nuisance, which undoubtedly was of a most serious character, has been or has not been abated. One thing is quite clear, that the nuisance was one which called for prosecution; and the propriety of the prosecution has, indeed, been admitted by the defendants, who have pleaded guilty. It is clear, therefore, that they must pay the costs of the prosecution; and we see no reason for delaying the payment of those costs, and we think that the payment of them ought to be a condition precedent for any further indulgence we may be disposed to afford them. Not being quite satisfied as to whether the nuisance has or has not been abated, we are disposed to give them some further time to try experiments, with a view of preventing the continuance of the nuisance. Let the case, therefore, stand over until the next sittings in November, but with this understanding, that though the sittings here will, before long, terminate, the Judges having to go the Circuits, there will be a Court from time to time, and one of the members will be my brother Mellor, who is in full possession of the facts of the case; and if the nuisance is found still to continue to so serious an extent as to call for the further interposition of the Court in the form of a final judgment, an application may be made to the Court for judgment; and the defendants must take this warning, for we are thoroughly sensible of the serious and offensive character of the nuisance, as it has heretofore existed, and we are determined to use the full power of the Court to suppress it, if it cannot be so altered in character by the defendants as to cease to be a nuisance to the inhabitants. Let the case, then, on that understanding, stand over till November.

#### COMMON PLEAS DIVISION.—SATURDAY, JUNE 22. (Before Justices GROVE and LINDLEY.)

WALKER v. THE GASLIGHT AND COKE COMPANY.

Mr. WILLOUGHBY and Mr. CRISPE appeared for the plaintiff; Mr. WILLIS, Q.C., and Mr. PAINE for the defendants.

The plaintiff in this case was a labourer who last year was in the employ of a firm of contractors who were engaged in constructing a steam lift at the works of the defendants at Bromley-by-Bow. Whilst the plaintiff, on the 16th of July, was stooping down, a derrick belonging to the defendants fell across the rope of another derrick, and this last-mentioned derrick struck some heavy planks three inches thick, and one of them fell from a height of twenty feet upon the plaintiff, and struck him on the back of the neck. He received a number of injuries, the most serious of them being, according to his case, a partial dislocation of the vertebra, accompanied with all the distressing symptoms likely to follow from such a hurt. One result was that the plaintiff's head was twisted round rearwards, and there was also paralysis. He was attended by various medical men, he was in the hospital for a considerable time, and he was watched both when awake and when asleep. Medical tests were applied to see whether there really was paralysis. The medical evidence for the plaintiff was that the symptoms exhibited were all real, whilst the medical men on the other side believed he was shamming. The trial took place before Justice Manisty at Chelmsford, and the Jury found a verdict for the plaintiff, damages £1050. Subsequently his lordship expressed himself as satisfied with the verdict. This Court, however, granted a rule to show cause why there should not be a new trial upon the grounds that the verdict was against the weight of evidence, and that the damages were excessive; and more especially upon some affidavits which stated that soon after the verdict the plaintiff was seen walking about apparently in good health, most of the symptoms from which he had previously suffered having very quickly disappeared. Affidavits were now produced on behalf of the plaintiff. Three medical men stated that they had examined him recently, and found the symptoms existing as they were before the trial. It was feared that the injuries would be permanent. There were two other affidavits by persons who knew the plaintiff, and they confirmed the statements of the medical men to some extent. Upon the question whether the damages were excessive, it was stated on one side that the plaintiff's income was 30s. a week, and on the other side 25s., or less. The defendant's counsel contended that the damages must be held to be excessive because the Jury had awarded the plaintiff about 17 years full income. On the other side it was said that, taking into account the plaintiff's sufferings, and the state to which he was reduced, the amount could not be said to be too much.

Justice GROVE, at the close of the arguments, said the Court would make an order in the following terms:—They directed a new trial for the re-assessment of damages only (the question of negligence being taken as proved) on the defendants paying, within ten days, to the plaintiff £100, and £50 to his solicitor on account of costs, the further costs of both trials and the rule being in the discretion of the Judge at the second trial.

Rule absolute for a new trial.

### Miscellaneous News.

#### METROPOLIS WATER SUPPLY.

Major Bolton reports that the state of the water in the Thames and Lea was clear up to the 11th of May, after which it was very turbid and much discoloured, and remained in a bad condition during the remainder of the month. In the Thames, at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated), the water was indifferent on the 1st, when it slightly improved and became clear; it remained in a good condition up to the 11th, on which date floods prevailed, and from that time until the end of the month it was in a turbid condition. The highest flood state of the river at Hampton during the month was 1 foot 3 inches above summer level, and the lowest 3 inches below the summer level. The Thames was in a state of flood for the latter half of the month. The West Middlesex Company have been called upon by the Thames Conservancy to lower a portion of their 36-inch conduit under the bed of the river between Barnes and Hammersmith, which was laid in 1836, to allow of the bed of the river being dredged. The important work of lowering this conduit is now proceeding.

#### PLYMOUTH AND STONEHOUSE GAS COMPANY.

The Annual Meeting of the Shareholders was held at the Works on Thursday, the 20th inst.—Mr. J. WILLIS in the chair.

The report of the Directors stated that the affairs of the Company were in a very satisfactory condition, a considerable increase in the consumption of gas having taken place during the past year. After payment in January last of the authorized half-yearly dividend, and making provision for outstanding debts, there remained a disposable balance of £6715 15s. The Directors recommended the payment out of this sum of a further dividend of 10s. per share on the original shares, 7s. 6d. per share on the additional shares, and 3s. 9d. per share on the new additional shares, and that the remaining balance of £3215 15s. be carried forward to the credit of next year's account. The price of gas to private consumers was reduced to 2s. 3d. per 1000 feet, and the public lamps to £2 14s. per annum, from Lady-day last. The Directors, with a view of meeting the

increasing demand for gas, had made contracts for the erection of a new retort-house. Larger pipes had also been ordered, to replace the present main from the Crescent to Durnford Street, which would afford a better supply to the consumers of Stonehouse generally. After alluding to the death of their late Chairman, Mr. Adams, the report stated that Mr. George Henderson, who had filled the office of Secretary from the formation of the Company, retired at Lady-day last. The Directors considered it unnecessary to remind the Shareholders of the important services rendered by Mr. Henderson in the exemplary discharge of his duties during this long period of 34 years. These services merited, in the opinion of the Directors, a substantial acknowledgment from the proprietary, and they had unanimously agreed to a resolution that an annuity of £400 be granted to Mr. Henderson during his life. The Directors also reported that they had elected Mr. Henderson a Director, in the place of the late Mr. Adams, whereby the Company would continue to receive the benefit of his great experience and matured judgment. Mr. John Thomas, who had been upwards of 20 years in the service of the Company, had been appointed Secretary.

The CHAIRMAN moved the adoption of the report, and in doing so stated that during the past year there had been a larger increase in the consumption of gas than in any previous year. The Directors were fully alive to the importance of extending their plant to meet the increasing demands and the requirements of the public. Consequently they had now in course of erection a large retort-house, and they were about to lay down a large main, which would afford a better supply of gas both for Plymouth and Stonehouse. When these improvements were carried out he thought they would hear very few, if any, complaints as to the supply of gas in the Company's district.

Mr. KING seconded the motion, which was carried unanimously.

The CHAIRMAN then moved:—"That, in consideration of the important services rendered to the Company by Mr. George Henderson, the late Secretary, an annuity of £400, to be paid quarterly, be allowed him from Lady-day last, when he retired, to the end of his life." He warmly eulogized Mr. Henderson for the manner in which he had discharged his duties. In 1844, he said, Mr. Henderson projected the Gas Company. The supply was then inadequate, impure, and injurious to health. Then the price charged those who by favour had a meter was 9s. per 1000, and it was reckoned that those who paid by the light paid 16s. per 1000. At that time Mr. Henderson canvassed the three towns, and got the present Company together. Great difficulties were then experienced in many ways, one being in regard to money. Mr. Henderson placed a large sum of money at the credit of the Company to carry out operations when by Act of Parliament they could not raise the amount required. Therefore he considered the Company were under very deep obligations to Mr. Henderson. The price of gas now was 2s. 3d. per 1000, the lowest in the kingdom; and, besides this, he thought he was justified in saying they could challenge the kingdom as to the purity of their gas. The £10 shares were now selling at £24 each, and other shares in proportion, which showed a considerable advance in the value of their property. He might tell the meeting that in dividends the proprietors had received no less a sum than £139,579. That sum had circulated mostly throughout Plymouth and Stonehouse, and must have been productive of good to the people at large. He contended that the present satisfactory position of the Company was due in a great measure to Mr. Henderson.

Mr. ELLIS seconded the motion, remarking that the services rendered by Mr. Henderson had been so valuable that he would have been glad if it had been proposed to give him £500 a year.

Mr. CHASE said he could not agree with Mr. Ellis in this matter, because he thought all public companies should be careful how they established precedents. Still, Mr. Henderson had been an exceedingly valuable servant, and he hoped the Company would reward him for the amount of time and attention he had given to the work. Whilst extolling Mr. Henderson, however, he thought they ought to remember that Mr. Browning (the Engineer) was entitled to some consideration and eulogy. He thought the thanks of the consumers were really due to that gentleman, because the price of gas was so low.

Mr. LANSDOWN supported the resolution, and said he had no doubt that when the time came the other officers would be spoken of as Mr. Henderson had been.

Mr. HAWKE said he was the representative of the consumers in this matter, and they, he said, would be taxed or surcharged 4d. per 1000 feet to meet the proposed annuity. £400 a year was a very large sum to grant for life, and he argued that possibly something would be invented to supersede gas, as gas had superseded something else; and, therefore, he was afraid the proposers had scarcely contemplated their position, and he also submitted that the Company had not had the entire services of Mr. Henderson. He had earned money in various other ways—i.e., as Auditor of the South Devon Railway Company, also in connection with the Launceston Gas-Works, and by giving professional evidence in Parliament.

The CHAIRMAN thought they ought to be thankful that Mr. Henderson was competent to give evidence in the House of Commons.

Mr. HAWKE said he would rather give Mr. Henderson a lump sum than grant him £400 a year for life, considering the circumstances that he had mentioned.

Mr. KING, in reply to Mr. Chase, remarked that, in eulogizing the services of Mr. Henderson, it by no means followed that they depreciated the services rendered by the Engineer and the other Officers of the Company. He was surprised that Mr. Hawke, who was usually correct in a matter of this kind, was so far out of his reckoning when he said it would take 4d. per 1000 to cover the annuity. Something like the fourth part of a farthing, with the present consumption, would be sufficient, and he did not think any one was likely to suffer from that.

Mr. H. BROWN, Mr. I. WATTS, and Mr. WOOLLAND also supported the resolution, which, on being put to the meeting, was carried with but two dissentients.

Mr. HENDERSON, in returning thanks, said he had been 34 years connected with the Company, and during the whole of that period he had tried to do his best for the interests of the Shareholders. With regard to what Mr. Hawke had said, he came into the Company after it was firmly established, and was not therefore competent to express an opinion on the services he (the speaker) had rendered. Although retired from the secretaryship, it would be his duty and privilege to give the affairs of the Company that supervision he was accustomed to give in years past.

A motion that dividends be paid as recommended by the Directors in the report was carried unanimously.

The retiring Directors and Auditors were re-elected, and votes of thanks having been passed to the Chairman and Directors, the meeting closed.

PROPOSED NEW ASSOCIATION OF GAS MANAGERS.—We are happy to hear that it is proposed to form an Association of Gas Managers for the South-West of England, and a number of managers resident in the district met at Weymouth, on the 14th inst., for the purpose of making the necessary arrangements. It was decided to call a general meeting at Sherborne, on the second Tuesday in September, for the adoption of rules and appointment of officers. Mr. T. W. R. White, of Sherborne, is acting as secretary *pro tem*.



## ROCHDALE CORPORATION GAS-WORKS.

The Annual Report of the Gas Committee of the Corporation of Rochdale states that, notwithstanding the reduction made in the price of gas last year (equivalent, in the aggregate, to over £4000 per annum) the Committee are pleased to state that, in consequence of more favourable coal contracts, and by a more careful supervision exercised over the manufacturing department, the profits during the past year are the largest that have ever been realized. After paying interest and 1-75th part of debt, and all other liabilities, the surplus profits amount to £8622 9s. 2½d.

The coke receipts are about the same this year as last. The per centage of coke sold was 37 per cent. of the material carbonized; last year being 43 per cent.

The Committee have not thought it wise, during the past winter, to work the hydraulic stoking machinery, in consequence of two-thirds of the retorts then in use being of a small size. Renewals are now being made, and when completed, all retorts will be of the size required for the successful working by machinery.

Considerable expense has been incurred during the year by the failure of one of the gasholder-tanks, which required considerable alterations to be made in the construction, in order to prevent the recurrence of a similar accident. The tank is now satisfactory, and all expenses connected therewith have been charged to revenue account.

The new governor-house and offices have been nearly completed, and the station-governors placed in position. The connecting-mains are now being laid. The respective governors will supply respective districts, and thus give a more perfect control over the total area of supply than has hitherto been attained.

It is the intention of the Committee, during this year, to replace the No. 1 station-meter with one of larger capacity, as it is proved the present means of registering the gas manufactured in winter is unreliable.

The following brief summary represents a comparative view of the working for the years ending March 25, 1878, and March 31, 1877—viz., gas sold and used this year, 219,577,900 cubic feet; last year, 221,391,000 cubic feet; decrease, 1,813,100 cubic feet. Value of gas sold, after deducting discounts, this year, £43,297 15s. 11½d.; last year, £47,435 4s. 3½d.; decrease, £4137 8s. 4d. The profits this year amount to £8622 9s. 2½d.; last year, £6903 1s. 6½d.; increase, £1719 7s. 8d.

The present number of consumers is 19,312; last year, 18,550; increase, 762. New lamp services laid this year, 21; making total new services laid this year, 783.

2672 yards of new and additional main-pipes have been laid during the past year in various roads and streets, at a cost of £1368 17s. 9d. The services referred to above cost £394 8s.; extensions on works during the year, £2261 15s. 6d.; making total amount chargeable to capital, £4025 1s. 3d.

During the past year, the illuminating power of the gas was tested daily on the Sugg-Letheby photometer, the gas being consumed in a "London" standard Argand burner at the rate of 5 cubic feet per hour, against two standard sperm candles, each consuming 120 grains of sperm per hour, corrections being made for barometric pressure and temperature if required. The average illuminating quality for the year was 17.91 candles. Only on one occasion the quantity of sulphur found exceeded that allowed by Act of Parliament, being 1.44 grains in excess. With regard to sulphuretted hydrogen, this impurity has, with few exceptions, never been detected in the ordinary and continual test. The gas has also been remarkably free from ammonia, only showing on rare occasions traces of this impurity.

## SANITARY ASPECTS OF ARTIFICIAL LIGHT.

[From the Medical Examiner.]

Some time ago we called attention to some of the more prominent features of the question of artificial lighting in its economical aspect, and we now make no apology for turning to the important sanitary bearings of the subject. It is obvious that these must have especial reference to the vitiation of the atmosphere consequent on the combustion of the illuminating agent employed. It has been pointed out, that where a complete and effective combustion takes place, the only products formed are carbonic acid and aqueous vapour. In the case, however, of coal gas, in addition to these ordinary combustion products, small quantities of sulphurous and sulphuric acids are formed, having their origin in the sulphur compounds always present in small but varying quantity in ordinary gas as it is supplied to the public. In the event of the gas containing ammonia as well as sulphur, nitrogen acids are likewise formed during combustion; but as London gas is practically free from ammonia, the question of nitrogen acids may be here omitted. The sulphur acids produced by burning gas are so exceedingly small in quantity, that it is only by refined chemical tests that their presence can be identified, and it has not been established that these special substances in such minute proportion have any injurious effect on health, although there has been much agitation on the subject among many not thoroughly acquainted with the question. The greatest objection to the presence of sulphur in coal gas appears to be the injurious action exerted by the combustion of it on articles of furniture, more especially those constructed of leather or bright metal. The action is, however, extremely slow, and only becomes appreciable after a lengthened exposure of the articles in places, such as large shops, where great quantities of gas are being habitually consumed. In order to give the reader some idea as to the amount of these sulphur acids present in the atmosphere of an ordinary room where London gas is being burned, it may be mentioned that Dr. Odling and Mr. Keates have shown that the total quantity at any given time is very much less than would be produced by striking a common sulphur match.

In considering the general question of atmospheric vitiation from the use of the various sources of artificial light, whether oil, gas, or candles, the vitiating power which each material exerts on the surrounding atmosphere may, for all practical purposes, be measured by the oxygen withdrawn, and by the carbonic acid produced. The sense of oppressiveness felt on entering a room where a large amount of some combustible agent is being consumed, is no doubt due mainly to the presence of an undue quantity of carbonic acid, the correspondingly diminished amount of oxygen and the heated condition of the atmosphere being minor conditions.

In judging of the comparative vitiation produced by the commoner illuminating agents, the true mode of viewing the question is to ascertain the amount of oxygen required, and of carbonic acid produced, by the amount of each material necessary to be burnt in order to produce equal quantities of light. By this method of estimation, gas (of 16-candle value) stands highest on the list, followed closely by paraffin oil, and then by sperm and colza oils, and candles of sperm, wax, and tallow—that is to say, that in producing a given quantity of light, the least atmospheric vitiation is produced by gas, and the most by tallow candles. This statement is no doubt antagonistic to popular belief, for no idea is perhaps so generally received as that which attributes to gas a vitiating action far exceeding that due to the combustion of any other illuminating agent. This conception may be traced to the fact that in most cases where gas is used as a source of light, an amount of illumination is produced far exceeding in quantity that which would be generally obtained from oil or candles. In cases where we were formerly content with a couple of candles, or a single

lamp, affording at most a light of six or eight candles, it is now often customary to employ a two or even a three-light gaselier, the burners of which give a combined light of from 16 to 24 candles. With such increased light there are corresponding and equivalent amounts of atmospheric heating and vitiation. The remedy is to be sought in more efficient ventilation, and when it is more thoroughly understood that an increased consumption of an illuminating agent must be attended with increased vitiation of the surrounding atmosphere, the unfounded abuse of coal gas which is so frequently heard will, it is to be hoped, entirely cease. The question of efficient ventilation is a most important one, the ordinary class of rooms being singularly deficient in any provision for either the egress of foul, or the ingress of fresh air. The accidental opening of a door, and the imperfect fitting of doors and windows, leaving small chinks and apertures through which some interchange may take place between the atmosphere of the room and the external air, are, as a rule, the only means by which a kind of ventilation, imperfect as it is inefficient, is carried out. Ventilating gas-burners are, it is true, occasionally used, but their adoption is the exception rather than the rule, and it would need a somewhat extensive series of pipes to render such a system suitable to a private house where gas is used more or less in every room. The so-called "ventilating globe burners" consist of an ordinary gas-burner surrounded by a globe, and suspended from the ceiling by means of a comparatively wide metal tube; within this tube is a smaller one used for conveying the gas, while the products of combustion ascend between the two pipes, and are carried away to the external air. The well-known "sun-light" is likewise a ventilating arrangement carried out by the same means. The best forms of ventilating burners have, in the pipe which takes away the products of combustion, a self-acting valve arranged in such a way as to prevent cold air descending the pipe when the burner is not in use.

It now only remains to consider the question of what is the best source of artificial light as affecting the eyesight. Very little knowledge of an absolute description is available on this branch of the subject, but it may be laid down as a general rule that flickering lights, and those of great intensity, are the most trying to the eyes. The Argand form of burner affords the steadiest and best light, and perhaps the arrangement which is least trying to the eyes is to be obtained by the interposition of a shade so placed as to screen all direct light-rays from the eyes, at the same time that sufficient illumination is obtained at the place required for work. A medium should also be chosen between too little light, on the one hand, and too much light on the other; for, in the first case, the eyes become strained in endeavouring to obtain correct vision, and, in the second place, they become dazzled by the excessive glare. The colour of the object to which the eyes are directed is also a consideration. In the pursuit of literary work, for instance, a tinted paper will be found less fatiguing to the vision than if the paper is of a pure white colour. Dr. Croft has recently called attention to the question of colour as affecting weak or deficient eyesight. He is of opinion that spectacles fitted with yellow glass afford more relief to the patient than the ordinary ones provided with blue glass. Such spectacles are now sold under the term of "Xanthoscopic," or "Nonactinic." With the curious results of General Pleasanton fresh in our memory as to the stimulating action of blue glass upon animal and vegetable life, the opinions of Dr. Croft possess a considerable amount of probability. It is not unreasonable to assume that there may be two conditions of impaired or deficient eyesight, in the one of which the eyes of the patient may be in a peculiarly irritable condition, and in the other case the eyes may be simply weak and requiring stimulation. In the first of these assumed cases, yellow glass would be the most suitable medium to employ for spectacles, as arresting the blue rays of the spectrum, while in the second case the stimulating action of blue glass might be reverted to with advantage. Much remains to be done in the study of the physiological action of various coloured lights, and their effects on health and disease, and a careful investigation would, no doubt, be attended with results which would certainly be of the greatest interest, if not of the greatest practical value.

NEW GAS-WORKS AT MIDDLETON.—The *Oldham Standard* of the 8th inst. gives a long and interesting account of the rebuilding of the gas-works belonging to the Middleton and Tonge Improvement Commissioners. These works were designed by, and carried out under the superintendence of, Mr. D. A. Graham, Gas Engineer, who, it appears, is about to leave England for New Zealand. Commenting on the gas undertaking of the Commissioners, our contemporary remarks that, "during recent years the townships have borrowed money on the security of the gas-works, which, however, has not been expended on the gas-works, although the gas department has had to meet the interest due on this money, which now amounts, we understand, to upwards of £5000; so that not only is the gas department expected to clear all its own expenses, but they have also to meet an annual charge of upwards of £200, the interest for this money borrowed. Our readers are, of course, aware that this sum will be probably soon be transferred to another account, so that the annual profits will henceforth appear as so much more by the amount of this £200 or interest which has up to now appeared against the gas department. We think that there can now be no question but that the Commissioners are possessed of one of the best gas-works to be found anywhere—at least, as far as the alterations have extended. The gas is perhaps not so dear, considering the enormous liabilities which the town accepted when the works were purchased from the Company, for we understand this concern has been saddled with a debt out of all proportion to its value when purchased for the Commissioners. Modern gas-works are much more ornamental structures than those of former days, when, if we were to judge from our own, they were made to look as hideous and repulsive as possible. We do not see why this should be so; and if the ornamentation is obtained without entailing an excessive expenditure, we think it desirable that æsthetic considerations should not be entirely neglected. In the case of these works, ornamental effect seems to have been attained without involving any large amount of cost, as it has been principally accomplished by stepping the bricks out and in, which has had the effect of showing a picturesque arrangement of shadow, which is very pleasing in its effect. The works, while they have been in progress, have attracted a considerable amount of attention from men without the district, and their completion, which is near at hand, will doubtless be viewed with great interest by the public generally. We trust when completed they will practically be found to be all that has been expected and predicted concerning them, while there can be no doubt that Middleton and Tonge and district will possess one of the handsomest works to be found in the kingdom. In regard to the pecuniary yield of the works in favour of the ratepayers, the annuities have a very damaging effect. The original works were bought at a very high figure, and since a deal of foolish money has been expended on them, to which fact the late Chairman of the Board would be able to testify. While Manchester pays 5d. per 1000 for annuities and loans, Oldham 9d., and Stalybridge 13d., Middleton pays 22d., and has lost by leakage 20 per cent., against 10 in most other places. It is, therefore, evident that if the Middleton works are to meet the incubus they have to bear, they must be made efficient."



## PHENIX GAS COMPANY'S NEW GASHOLDER.

MR. CORBET WOODALL, M. INST. C.E., ENGINEER.

(Continued from p. 917.)

With the present number we publish the third of a series of drawings, illustrating the details of construction of the brick tank and gasholder now in course of construction for the Phoenix Company at their station in Kennington Lane, and we resume our abstract of the Engineer's specification for the same.

The specification provided that the concrete employed should be composed of seven parts of river ballast, sharp and clean, to one part of Portland cement, the whole quantity of ballast or other material and cement to be measured dry, the measure used not exceeding half a cubic yard in capacity. The ballast used was not to contain more than three parts of sand to four of stones, nor less than two parts sand in seven of the aggregate. The cement to be of the best quality, weighing not less than 112 lbs. per struck bushel, and capable of bearing, before breaking, a strain equal to 250 lbs. per square inch, after having been prepared seven days for testings. Before being used, the cement to be emptied from the bags and exposed on the floor of the shed for at least two days. The concrete when mixed to be placed in position by being shot from a height not exceeding 15 feet.

The footings were prepared by laying over the whole surface of the bottom of the excavated trench a floor of concrete 2 feet thick, in two courses, the same being carefully levelled. The upper surface of this concrete within the wall forms the floor of the tank.

In the 48 positions shown on the plan, on this floor, rest-blocks of concrete were formed after the wall was finished. Each block is 4 feet 6 inches long by 2 feet wide, and stands 6 inches above the floor level. The concrete was formed of five parts of ballast to one of cement, the upper surface of the blocks being made perfectly level with each other by a water-gauge. On the top of the mound, and through its sides, rings of concrete pillars are built, all having their foundations in the clay. Concrete floors are laid for supporting pipes, and to form floor of well, the two lower ones being one foot thick, and the floor of the well one foot six inches thick. The foundations of all the retaining walls are of concrete, and of the dimensions figured on the drawings. A bed of cement mortar (one cement to one sand) was laid over the concrete before the first course of footings was laid. In this wall, but in no others, two lines of iron band, each 2½ inches by one-eighth inch, were inserted every five courses, the iron being tarred and sanded, and rivetted at joints.

In constructing the tank, the bricks used throughout were thoroughly sound, hard, and well-burnt stocks of uniform shape and size; any of less dimensions than 8½ inches by 4½ inches by 2½ inches were rejected. The mortar employed was required to be composed of three parts clean sharp river sand to one of fresh-burnt blue lias hydraulic lime, mixed and incorporated in a mortar-mill. The cement was required to be of the same quality as described for the concrete, and to be used in the proportions of one of cement to three of clean sharp sand, except where otherwise specified. The brickwork is executed in English bond, flushed up and grouted in at every course, all exposed faces of walls being finished with a neat struck and drawn joint. The bricks were soaked with water before using, and the walls and piers carried up regularly, so that no part was more than 3 feet higher than any other part, and the courses were kept level throughout.

The following are the dimensions of the tank wall:—

From the top of the concrete footing already described, for a height of 20 feet, the wall is of . . . 5 bricks, or 3 feet 10 inches thick

20 to 25 feet of height, 4½ "	3 "	5 "	" "
25 to 30 " " " 4 "	3 "	0½ "	" "
30 to 35 " " " 3½ "	2 "	8 "	" "
35 to 40 " " " 3 "	2 "	3 "	" "
40 to top . . . . . 2½ "	1 "	10½ "	" "

The wall and piers are built in mortar, except in the seven bands, as shown in drawings, where they are built in cement.

There are 24 brick piers for carrying the guide-framing of the gasholder, each 7 feet deep by 5 feet 6 inches wide. Intermediately between the main piers are 24 secondary ones, formed by continuing the five bricks of thickness for a width of 3 feet 10 inches (5 bricks) to the top of the wall. For the height of 20 feet from footing, or as far as the wall is built against the solid clay, cement grout was run in at every course, so as to unite the wall to the back of the trench. The wall of the pipe-well is in cement 14 inches thick, standing on three courses of footings.

The specification provided that all stone should be laid on its natural bed, tooled on exposed surfaces, and bedded and jointed in neat cement. All stone, except bases for columns, to be "hard York." Twenty-four base stones were provided for guide-columns, each 7 feet by 5 feet 6 inches by 2 feet, from Bramley Hall Quarry, of the best quality, and free from any appearance of crack or shake; each stone having 7 holes for holding-down bolts, and dressed and sunk on surface to receive castings for base of column. There were also provided 24 caps for intermediate piers, each 4 feet by 4 feet by 6 inches. The coping round the wall of the tank is 2 feet 5 inches wide and 6 inches thick, put together in lengths of not less than 5 feet, exactly level and parallel with the rest-blocks at the bottom of the tank. The coping round the well is 18 inches by 14 inches, and the coping stones of the tank and well are chamfered and cut to the sweep of the same.

The Company provided the 30-inch inlet and outlet pipes shown in drawing, but the Contractor for the tank was required to fix the same, and provide all materials necessary for the jointing, being held responsible for the soundness of the work. He was also required to provide the flooring of oak planks for the pipes to rest upon, both inside and outside the tank wall. Each floor is 9 feet 9 inches long by 5 feet wide, spiked to four oak sleepers bedded in concrete.

## COMPARATIVE ILLUMINATING EFFECTS OF COAL GAS, SPERMACETI, AND COLZA OIL.

English and French Standards of Measurement of Light.

By Mr. ROBERT BRIGGS, C.E., of Philadelphia.

[From the American Gaslight Journal.]

The measurement of the illuminating power of coal gas is established by law in both England and France, each nation adopting its own unit of value and conditions of burning for the unit material, and for the coal gas measured by it. The English unit is a "standard" spermaceti candle, which must have the size and dimensions known commercially, in 1860 and before, as a "6's" candle, and is taken to burn at the rate of 120 grains per hour. The "standard" candle itself has now a more certain character than it had 20 or 30 years since. Custom and necessity for a uniform basis of test have now fixed each detail of size, material, method of making the standard candles, much more definitely than descriptions or drawings can express them, until the "standard candles" of any good English maker, under exactly the same conditions of burning, are reliable to give equal light, within the errors of observation by the eye, or within 10 per cent. of probable actual error.

This standard candle, when used for establishing the value of illuminating power of coal gas of different qualities, is compared with a

"standard burner." The latter, as usually taken in this country, is a "Sugg Argand," the dimensions of which are given by English law; but the absence of precise requirements as to form has permitted modifications which have increased the light-giving effect one-sixth or one-seventh above what would come from a burner of the form of 1860, without departing from the specified dimensions in the least. The legal requirement demands further that the burner shall consume at the rate of 5 cubic feet of gas per hour, under a pressure, at the point of ignition, of 0.5 to 0.6 inch of water column, with a temperature of from 65° to 70° for both air and gas.

The French lawful unit for comparison and measurement of the light from coal gas is a Carcel lamp, of designated construction, which shall burn at the rate of 0.0042 kilos. (0.009250 pounds) of colza oil per hour. Every precaution has been taken by the law-makers to state all the conditions as to construction of lamp and nature of oil, &c., so as to ensure uniformity of value for the standard unit; but the result is very little more positive than that from the English law, based merely on a trade usage. Perhaps the light from the standard French lamp is slightly more constant in value than that from the English candle. The advantage is solely that of a doubt in its favour.

The French standard burner is a "Bengel" Argand, of designated construction, and it is stipulated that it shall be compared with the standard lamp when burning at the rate of 105 litres (or 3.7083 cubic feet) of gas per hour, under the pressure of from two to three millimètres (0.78 to 1.18 inches) of water column.

The comparison of the English standard candle with the French standard lamp gives 9.6-candle power for the lamp. The candle burning 120 grains per hour, or 0.01714 pounds of spermaceti, demands for 9.6 candles 0.13714 pounds, while the lamp burns its 0.009259 pounds of oil in the same time; and it results that the light-giving power of spermaceti to colza oil—the light-giving effects in both instances being the most favourable—is as 1.000 to 1.492. The comparison of the French standard gas-burner with the English one, in candle units, is an easy one. If 9.6 candles are to be the equivalent to 3.7083 cubic feet in light-giving power, how many candles will be equivalent to 5 cubic feet? Solution of this sum in the rule of three gives 12.944; or, for practical purposes, 13 candles.

It may be claimed with fairness that average coal gas having the specific gravity of 0.426, and being generally like the gas which formed the subject of discussion in the paper in the *American Gaslight Journal* for April 2, 1878 (by the writer of this article), may be taken to have an illuminating power of 15 candles; and accepting this value, the comparison of the light-giving effects of coal gas, of spermaceti candles, and of colza oil in Carcel lamps, may be exhibited as follows:—

Equivalent to One Standard Gas-Burner.	Weight each.	Total Weight.	Weight of Material Consumed to give equal Light.
	lbs.	lbs.	lbs.
= 5 cubic feet gas . . . . .	0.426 S. G. = 0.0319	= 0.1595	. . . . . 1.000
= 15 candles . . . . .	120 grs. = 0.01714	= 0.2671	. . . . . 1.634
= 15 9.6 Carcel lamp . . . . .	42 grms. = 0.009259	= 0.1447	. . . . . 0.908

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is still not much that is new to report with regard to the coal trade of this district. The settlement of the dispute at the cotton mills in North-East Lancashire has naturally produced a firmer tone in engine classes of fuel, which will probably become scarce in the market as soon as the cotton operatives get fully to work, but with this exception there is no improvement whatever to report in trade. All classes of round coal, both for house-fire, gas-making, and iron-making purposes, are still very difficult to move, and with regard to the two last-named descriptions of fuel, very low prices continue to rule in the market. Best Arley for house-fire purposes is tolerably steady in price, but inferior sorts can be bought very low, and I have heard of an offer of gas coal (Arley) which would not leave much more than about 6s. per ton at the pit. This, of course, is an exceptional case, and for a considerable quantity, but it is an indication of what is going on in the market. Common coal for iron-making purposes is also extremely low in price, and those descriptions of round coal which will not bear stocking are pushed on the market at almost any figure. Apart from the special quotations which are made for quantities, and which are very difficult to ascertain, the average quoted prices at the pit mouth may be given about as under:—Best Wigan Arley for house-fire purposes, 9s. 6d. to 10s. 6d. per ton; second qualities of Arley, 7s. 6d. to 8s. 6d.; Pemberton four-feet, 7s. to 8s.; common round coal, 5s. to 6s.; burgy, 4s. to 5s.; and good ordinary slack, 3s. to 4s. per ton.

In the shipping trade extremely low prices continue to rule, owing to the heavy stocks held by many of the colliery proprietors, and which they are anxious to move in bulk.

In the iron trade there is still but little doing. Lancashire makers of pig iron manage to move off their present very small production to local consumers, but heavy stocks still remain on their hands, and with regard to outside brands offering in this district there is no material change to notice. For Lancashire pig iron delivered into the Manchester district the list quotations remain at 50s. 6d. to 51s. per ton for No. 3 foundry, and 49s. 6d. to 50s. for No. 4 forge, less 2½ per cent. The finished iron trade is extremely dull, but there is very little disposition to take lower prices, and Lancashire bars delivered into the Manchester district are quoted at about 46 2s. per ton.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

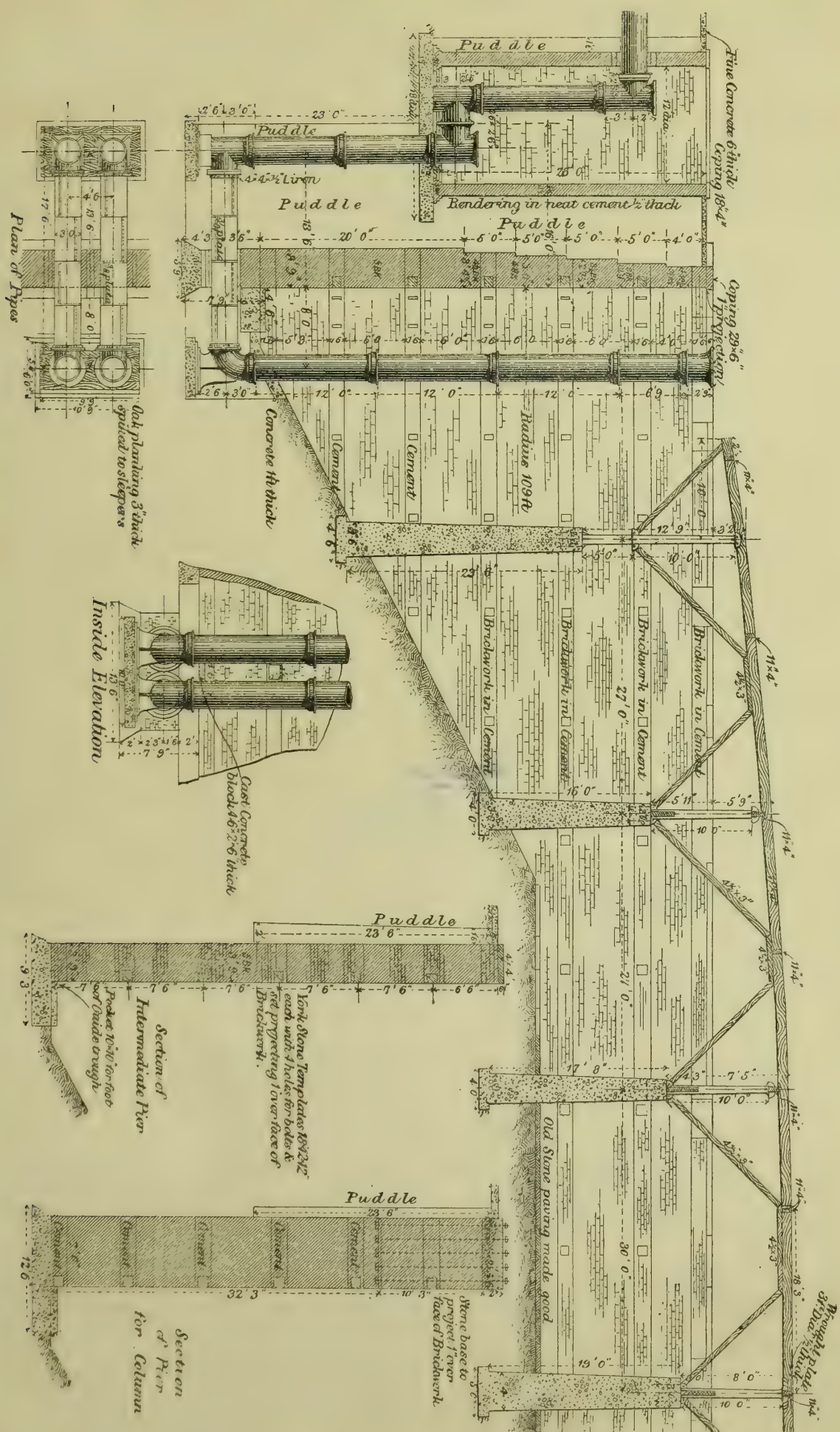
The coal trade of the counties of Durham and Northumberland has been materially slackened within the past fortnight. The colliery offices have much difficulty in maintaining prices. There is scarcely any demand for second-class sorts, and the collieries are working very badly. The figure for very best coals is about 7s. per ton net. Second-class gas cannot make more than 6s. net. Shipments to the United States have commenced. The freight market enables north country coalowners to compete with the American gas collieries, though there is a duty of 3s. 6d. per ton imposed upon British coals imported into the United States. The freight is 5s. per ton Boston and Philadelphia, and 4s. per ton New York. Some cargoes of gas coals have also been shipped to Ireland. Freight in the coasting trade for steamers are low, and distant gas companies are thus enabled to buy best Durham gas coals at a moderate figure. Steam coals are equally low with gas. Best are from 9s. 6d. to 10s., and seconds from 9s. as low as 7s. 6d. per ton net. House coals have been reduced also. The better qualities shipped from the Tyne are 9s. 6d. per ton, less 2½ discount. The second-class steam coal trade continues to be very much depressed. Pits do not work much more than from four to six days per fortnight, and the prospects are not very good.

The coasting shipping trade could scarcely be worse than it is, unless there were no trade at all. There are few orders in the market, and the freights which are paid are unremunerative. Steamers do the bulk of the



GASHOLDER TANK, 218 FEET DIAMETER, 44 FEET DEEP.

No. 3.









trade, as they can carry cheaper than sailing vessels, and it is almost impossible for little ships of from 10 to 12 keels to get paying employment. Baltic outward rates have been down to £8 per keel Cronstadt, but there has been an advance of something like 2s. 6d. per keel from this low figure. There has also been a fall of 10s. per keel upon Mediterranean rates. So that generally speaking it will be seen the outward freight market greatly favours the shippers. The only branch of manufacturing trade in the north which shows improvement is the chemical market. Its tone is decidedly better. Some articles have advanced in price, and there are improved shipments to the Continent of Europe. The lead market is not very strong. Pig lead is selling £17 per ton; dry white lead, £24; red lead, £18 15s.; flake litharge, £19 10s. Copper flat; cake and ingot, £66 to £68; best selected, £72 per ton. The iron trade continues in the same dull state it has been in for so long a time. There is little demand for fire-clay goods or fire-bricks.

#### TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The accounts of the Arbroath Gas Corporation for the year ending the 31st ult. show a surplus of about £1000. The consumers share of this profit, being one-half, will give a rebate of 5d. per 1000 cubic feet in the price of gas, as against 2d. last year, thus practically making the price for the present year 5s. 3d. per 1000 feet. Under the local Act of Parliament the other half of the profit goes to the Magistrates and Town Council, to be applied to the public purposes of the community. The exact amount of the annual profit, and that of the reduction in price, have not yet been publicly stated, as the annual meeting of the Gas Commissioners has not yet been held.

Both the Edinburgh and the Edinburgh and Leith Gaslight Companies have just announced a reduction in price to 4s. 2d. per 1000 cubic feet, last year's selling price being 4s. 7d. in each case. The meter-rent, 2s. 6d. per annum, will in each case continue to be the same as at present, and so also will the discounts continue to be unchanged.

The Directors of the Selkirk Gas Company have declared the usual dividend of 10 per cent. on the profits of last year's transactions, and have reduced the price of gas from 5s. 10d. to 5s. 5d. per 1000 cubic feet.

In the report just issued by the Directors of the Hawick Gas Company to the Shareholders, there is shown a profit for the past year amounting to £1458 19s. 0½d., the share capital being £9250. The consumption of gas during the year has been about 20 million cubic feet. The Directors recommend that the price of gas for the ensuing year be fixed at 4s. 2d. per 1000 cubic feet, being a reduction of 10d. from the price of the previous year. It is estimated, taking into account the high illuminating power of the gas supplied (31 candles) and the quantity consumed, the price will now compare favourably with that of any other town in Scotland at such considerable distance from the parrot coal-fields.

At the last meeting of the Town Council of Rothesay, it was reported by the Gas Committee that the works under their charge were in a satisfactory condition, that there had been an increase in the amount of gas manufactured during May, to the extent of 134,000 cubic feet, as compared with the corresponding month of last year, and that the cost of production had been 8½d. per 1000 cubic feet less.

The arbiters selected by the Gas Commissioners of Kirkintilloch and the Gas Company have accepted their appointments; and, having met, have appointed Mr. D. T. McLay, solicitor, Glasgow, as their clerk in the submission; and they have also agreed on Mr. John Reid, of the Edinburgh and Leith Gas Company, as oversman.

By way of supplementing the item of news formerly mentioned regarding the expected reduction of the price of gas in Dundee, I may state that the annual meeting of the Gas Commissioners was held last week, when a most interesting and satisfactory statement was made by Mr. Mitchell, Convener of the Finance Committee, followed by some very valuable statistical information from Mr. Maxwell, Convener of the Works Committee. It appeared that during the last year £54,858 9s. 2d. had been realized from the sale of gas, and £5756 from the sale of chemical products, &c. The quantity of gas sold was 263,677,300 cubic feet. The expenditure had been £59,447 19s. The Commissioners had power to borrow to the extent of £200,000, and the sum borrowed amounted to £106,562 10s. The total amount expended on capital account at the beginning of the year was £98,571 8s. 10d., and during the year that sum had been increased by £13,929. The estimated expenditure for next year was £59,906, and the estimated revenue £60,197. The price of gas would now be reduced from 4s. 2d. to 3s. 11d. per 1000 feet, with 5 per cent. discount when paid within 28 days. The accounts were unanimously approved, and the price of gas fixed at 3s. 11d. per 1000 feet. A special vote of thanks was given to the Convener of Finance for his statement, and also to the Convener of Works for his diligent attention and services. It is worthy of mention that the plan of allowing discount has worked remarkably well, over £2000 being allowed last year as discount, representing 75 per cent. of the gas as paid prompt. The bad debts are reduced to a minimum.

The annual meeting of the Shareholders of the Catrine Gas Company was held last Tuesday evening—the Chairman, Mr. G. Parker, presiding. A dividend of 5 per cent. was declared on the present value of the shares, which is equal to 7½ per cent. on the original capital of the Company, and it was resolved to reduce the price of gas from 7s. 6d. to 6s. 8d. per 1000 cubic feet. During the past year extensive repairs were made on the gas-works, which are now in a much better position to meet the wants of Catrine, which is one of the most important manufacturing villages in Ayrshire.

At the annual meeting of the Muirkirk Gaslight Company, Limited, which was held on Monday, the 17th inst.—Mr. Charles Howatson, of Dornel, presiding—a dividend of 10 per cent. to the Shareholders was declared payable, free of income-tax, on and after the 20th inst., and the price of gas was reduced from 5s. 5d. to 5s. per 1000 cubic feet. It was announced that the loss of gas by escape and condensation for the past year was 8·62 per cent. So far as I am aware, there are only about half-a-dozen places in Scotland that claim to have a smaller result under the same head, while there are numerous places where the loss is admitted to range up to 20 per cent., and even higher.

The first annual meeting of the Coatbridge Gas Company, as incorporated by Act of Parliament, was held last Thursday—Mr. James Lusk in the chair. There was a large attendance. The report of the Directors, declaring a dividend of 10 per cent. on the original, and 7½ on the new capital, besides carrying over a balance, was unanimously adopted.

In his report upon the quality of the gas supplied in Glasgow, during the week ending the 15th of June, Dr. Wallace shows that the minimum ranged from 25·72 candles up to 27·23 candles, the average from 26·29 candles up to 27·41 candles, and the maximum from 26·67 candles up to 27·68 candles, the highest results in all cases occurring in the southern, or Tradeston district, which were very uniform.

An extraordinary meeting of the Shareholders of the Rothesay Water Company, was held a few days ago, when the following resolutions were unanimously adopted:—First, that the whole rights, property, and plant belonging to them be sold to the Burgh of Rothesay as at Whitsunday

last, and the price, with interest at 4 per cent. from date of entry, be paid at Martinmas next. Secondly, that the Company be wound up voluntarily in terms of the Companies' Act, 1862. The following are the terms of the transference:—(1) The price shall be paid on the 11th of November next. (2) The entry of the Town Council shall either be at Whitsunday last, in which case interest at 4 per cent. per annum will be paid on the price from that date, or at Martinmas next, as the Shareholders of the Company may elect. (3) In addition to the payment of the sum of £25,000, the Town Council shall reimburse the Company for any sum above £10,000 expended by them on extension or capital account. (4) On payment of the sums last mentioned, the Company shall transfer to the Town Council, by such deeds as may be required, the whole rights, property, and plant belonging to them, except the sums owing to them, and cash on hand as at the 11th of November next. (5) The whole expenses of the transference shall be borne by the Town Council and the Company.

The Dundee Water Commissioners held a special meeting on Thursday week, for the purpose of having submitted to them a statement of the accounts for the year ending the 15th of May last. It appeared that there was a surplus of revenue from the previous year of £175 6s. 2d., that the revenue for the past year was £31,768 11s. 5d., and the expenditure was £31,827 9s. 4d., leaving a favourable balance of £116 1s. 3d. The domestic rate had yielded £14,951 14s. 7½d.; public rate, £2653 12s. 2½d.—both under estimates. The special rates had yielded £14,762 17s. 7d., being £762 17s. 7d. more than in the previous year, and more than double the sum they yielded in 1870-71.

The Superintendent of the Greenock Water-Works reports that on the 1st of June the water in store amounted to 452,571,179 cubic feet, or 129 days supply for all purposes. In one of the reservoirs the depth of water was fully 48 feet, and in other two fully 43 feet.

At a meeting of the Glasgow Water Commissioners held last Thursday, an elaborate table was submitted, showing the results of the system of night inspection recently instituted, as at date 9th of May. From this it appeared that the total average per head at the starting of the meters was 53·1 gallons per 24 hours, and at 9th of May it was 31·9 gallons, thus showing a saving of 21·2 gallons per 24 hours.

At a meeting of the Committee of the Town Council of Glasgow to consider the best means of disposing of the sewage of the city, held on the 14th inst., it was agreed to recommend to the Council that the sewage should be carried to Dalmuir, on the north side of the Clyde, and about seven miles below the city, where it will undergo a process of filtration before it is allowed to enter the river. The proposal embraces the interception of the sewage at a certain point in the city, and then carried to Dalmuir in a large sewer, which will have to be constructed for the purpose. If the Council approve of the scheme, it is more than probable that operations will be commenced at once to carry it into effect, as a considerable portion of the ground in the neighbourhood is now the property of the Corporation. This is in part the scheme of Sir John Hawkshaw, although his proposition was of a more extensive nature, and the point at which the sewage was to enter the Clyde was much more distant from the city, Sir John proposing that it should be conveyed to the Ayrshire coast. The proposal of the Committee will excite a good deal of interest, and probably no small amount of opposition.

A drainage scheme has been devised for the Burgh of Alyth, at a cost of fully £3000, and one for the Burgh of Irvine and Halfway, which is expected to cost over £1800.

The past week's Glasgow pig iron market was tolerably steady, and a fair amount of business was done. On Friday afternoon the closing prices for buyers were 50s. cash and 50s. 1d. one month; sellers near, and generally about 1d. over the closing price on the previous Friday.

Coal is still a drug in the market, but it is thought that better times are drawing nigh.

**SALE OF DUNDEE GAS AND WATER ANNUITIES.**—Mr. D. G. Stewart, solicitor, Dundee, has just sold the following annuities which belonged to a trust estate:—Four annuity certificates under the Dundee Gas Act, 1868, amounting in all to £46 2s. per annum, were purchased for £1100; a water annuity for £22 15s. was sold for £546, and one for £5 for £120.

**RESIGNATION OF THE ENGINEER OF THE BOLTON GAS-WORKS.**—At a meeting of the Corporation Gas Sub-Committee, on Friday last, the resignation of Mr. Harrison Veevers, Engineer and Manager of the Gas Department, was accepted, his connection with the Corporation to terminate on the 31st of December next. Mr. Veevers has held the office since February, 1865, a period of over 13 years.

**CLACTON-ON-SEA WATER SUPPLY.**—The *Suffolk Chronicle* states that a trial boring, with a view to obtain a supply of water from the chalk, has been proceeding at this rapidly-increasing watering-place for some time, under the direction of Mr. Jabez Church, C.E. Water was struck at a depth of about 290 feet, but proved on examination to be considerably charged with salt. This having been shut out, the boring was continued, and last week, at 405 feet, water was again reached, which rose to within 35 feet of the surface, and promises to provide an abundant, pure, and fresh supply. It is intended to sink an artesian well at once, and to establish water-works, the Act for which, in conjunction with the gas-works, already in working order, was lately obtained.

**REDUCTIONS IN THE PRICE OF GAS.**—The Directors of the Reading Gas Company have given notice that, chiefly in consequence of the favourable contracts made for coals, the prices of gas have been reduced, from and after the 31st of March last, as follows:—When the consumption shall not exceed 20,000 cubic feet per half year, from 4s. 3d. to 4s. per 1000 feet. Over 20,000, and not exceeding 40,000, from 4s. to 3s. 10d. per 1000 feet. Over 40,000, from 3s. 9d. to 3s. 7d. per 1000 feet. 1s. per 1000 feet extra for gas supplied beyond the boundaries of the borough. No charge is made for the use of meters unless the consumption is under 2000 feet.—The Gas Supply Committee of the Bradford Corporation have recommended that the price of gas be reduced from 3s. 4d. to 3s. per 1000 cubic feet from the 1st prox.

**WOKINGHAM WATER SUPPLY.**—A new Company has been formed, and incorporated by a Provisional Order of the Board of Trade, under the Gas and Water Works Facilities Act, 1870, for the supply of this district, which comprises the town and parish of Wokingham, and the parishes of Binfield, Warfield, Easthampstead, and Sandhurst, in the county of Berks. It is proposed to place the well and pumping-station on a site which has been secured near the Finchampstead Road, between the brook and the South-Eastern Railway, and the reservoir on a piece of land which has also been secured on the high ground between Wokingham and Bracknell, known as Windmill Hill. In the opinion of the Engineer, Mr. J. W. Grover, a supply of pure chalk water, sufficient for the district, will be obtained at a depth of about 400 feet, and in this view he is confirmed by the authority of Mr. Whitaker, one of the geologists of the Geological Survey of the United Kingdom. From the well, the water will be lifted by pumping engines to the reservoir, the elevated position of which will admit of its supplying nearly the whole of the district. The population within the area of supply is about 12,000, and the number of inhabited houses 2150.



**BRISBANE (QUEENSLAND) GAS COMPANY.**—The report of the Directors of this Company to Dec. 31, 1877, stated that the business was improving. During the latter part of the half year many new consumers had been obtained on the old lines of mains; and some extensions, notably that to the One Mile Swamp, had been made, which promised a good consumption. It had been decided to abolish the charge for rental of meters—a change which would doubtless be acceptable to the consumers. The loan of £10,000, referred to in the previous half-yearly report, had been completed, and the money so obtained would be applied to making important additions and improvements to the works, tenders for which were about to be called for. The net amount at credit of profit and loss was £2669 18s. 11d.; balance from last half year, £25 13s. 10d.—total, £2695 12s. 9d. After placing to the credit of reserve-fund £1000, there remained for distribution £1695 12s. 9d., out of which a dividend at the rate of 10 per cent. per annum, and a bonus of 2s. 6d., was recommended, absorbing £1500 0s. 6d., leaving to be carried forward £195 12s. 9d.

**HENGOED GAS AND WATER COMPANY.**—The second general meeting of Shareholders was held on the 20th inst.—Mr. Lewis in the chair—when the Directors reported that the works were in a sufficiently forward state to commence the manufacture of gas on the 6th of December last, and they have been for some time duly completed, and are now in excellent working order. As intimated in the last report, the mains have been extended to Fleur-de-Lis and Pengam, and the Directors anticipate there will soon be a fair revenue from those localities. The Parish Authorities for that district have also decided to erect at once twelve public lamps, and the Hengoed and Maescwmmmer districts are expected to be soon similarly situated. The Rhymney Railway have already fitted up their station at Hengoed, and the Brecon and Merthyr Company have also fitted their stations at Maescwmmmer and Pengam, and are adopting gas on their signals between those stations, and the Directors hope the Great Western Company will follow the example of the other Railway Companies before next winter. The balance of revenue account was £57 6s., which it was resolved to carry to the credit of the current year.

**EDINBURGH WATER SUPPLY.**—At the meeting of the Edinburgh and District Water Trust, on the 13th inst., a report was submitted by Mr. Coyne, in which he stated that the number of pipes laid since the works were taken over by the Trust was equal to 57½ miles, of which 4½ miles were laid in extension of the system, and 15½ were relays instead of old, small, and corroded pipes previously in use. During the same period (eight years) the population supplied with water had increased by over 66,000. In addition to this large increase of population, a superior class of houses, having hot-water apparatus, had been built, and there had been a very large increase in the number and magnitude of industrial works for which water was required and used. Water for shipping, street-watering, and sanitary purposes had also largely increased in consumption. The middle and working-class population were rapidly acquiring habits of using more water than in former times, inasmuch as it was becoming quite a common practice to introduce baths into the new houses built for this class of citizens. He thought it expedient to bring the foregoing facts before the Board, with a view of fully informing them of the great problem and difficulty they had to contend with in supplying so vastly increased a population, and distributing a small quantity of water over so largely an extended area of supply, while they had no more present sources of water supply than those which were at the command of the old Water Company ten years ago.

**A MOVING TOWN.**—The report of a very singular occurrence comes from Virginia City, Nevada. "Our town," says a local newspaper, "is very quietly and very slowly moving to the eastward, down the face of the mountain." This movement is attributed to the settling of the ground over the Bonanza mines. As all the town is "going together," there is little evidence on the surface of what is going on beneath. No cracks are to be seen. The Gas and Water Companies are better acquainted with the movements taking place in the ground forming the site of the town than most of its inhabitants, as the instability of the earth tells upon their pipes. On B and C streets, north of Union, the ground is said to be moving both north and east. A water-main uncovered the other day in B street was found to be telescoped to a distance of over a foot, and had, moreover, in it a great "kink," which made it necessary to take out a piece nearly 2 feet in length. At a pan mill in the town, the pipes, it is stated, "are crowding in from both east and west, owing to the settling of the ground in the neighbourhood. Although there are no cracks as yet in the central part of the town, there is a large and very ominous one to the westward. The International Hotel has moved east about 5 inches since it was built; and all the buildings in the part of the town where the hotel is situated have moved the same distance. The town is evidently travelling somewhere, but where it means to go nobody knows. In the meantime, except in the matter of gas and water pipes, no inconvenience has been felt."—*Ottawa Citizen*.

## Register of New Patents.

272.—**WALLACE, R. W.**, Battersea Park, and **CLAUS, C. F.**, Great St. Helen's "Improvements in the purification of gas and utilization of by-products by the manufacture of secondary products therefrom." Patent dated Jan. 20, 1877.

This invention relates to the purification of gas, and the utilization of certain products resulting therefrom.

Instead of the scrubbers and purifiers now used, square towers are employed, filled with angle irons, or triangular bars of stone, stoneware, or earthenware. The angle pieces are placed together closely in layers. The gas to be purified is admitted to the bottom, and is conducted away from the top of the tower. Immediately above the outlet-pipe for the gas there are two additional layers of angle pieces crossing each other at right angles, or nearly so. These angle pieces are for the purpose of distributing the liquor. Over these two layers of angle pieces there is a so-called tumbling-box, into which the purifying liquid is discharged from a pipe attached to a force-pump, which raises the liquor from a reservoir placed below the tower to the top of the same.

As the purifying agent, to absorb the carbonic acid contained in the gas, ammoniacal gas or liquid ammonia is used, which is obtained by decomposing chloride of ammonium by means of burnt or slaked lime, this chloride of ammonium being obtained in a subsequent process hereafter described.

If the ammonia is used in the form of ammoniacal gas it is passed along with the illuminating gas through a number or series of the towers above described, and whatever quantity of ammonia remains unabsorbed is finally condensed in one, two, or more of the last towers of the series by a shower of water or weak liquid descending in the towers. This liquid is pumped from tower to tower in the opposite direction to that in which the gas travels, and the liquor ultimately resulting from this procedure, and which contains principally carbonate of ammonia, is drawn for further use from the tower, which by reason of its favourable temperature and other conditions will yield the liquid in the most concentrated form—that

is to say, containing the greatest quantity of carbonate of ammonia; in other words, a kind of "fractionation" is allowed to take place in the towers or scrubbers, which may be aided by the application of heat from any extraneous sources. If this concentrating action of the towers should be found not sufficient to attain the desired object, the liquor is distilled in an apparatus separate from the gas plant, in order to obtain solutions of carbonate of ammonia of the required strength in a manner well known to chemists.

If the ammonia for the purification of gas is employed in the form of liquid ammonia, it is produced in separate apparatus by condensing the ammonia evolved by the action of lime on the chloride of ammonium in water or weak liquors, and the liquid so obtained is pumped in the opposite direction to that in which the coal gas travels from tower to tower, always keeping one, two, or more of the last towers or washing towers (as in the process above described) to prevent the remaining of any of the volatilized ammonia in the coal gas. In the concentrated carbonate of ammonia liquor is dissolved in separate apparatus an equivalent quantity of chloride of sodium; a current of carbonic acid is then passed through the mixture, whereby, as is well known, a bicarbonate of soda salt is deposited in the liquor—that is to say, according to the strength of the liquors employed, from about two-thirds to four-fifths of an equivalent of the chloride of sodium employed, whilst about one-third to one-fifth of an equivalent of the chloride of sodium, as well as of the corresponding quantity of carbonate or bicarbonate of ammonia, remains in solution, either as bicarbonate of soda, or, if heat be applied to the mixture, as chloride of sodium.

Other compounds of ammonium that may have been present in the original carbonate of ammonia solution employed, such as sulphide of ammonium or sulphocyanide of ammonium, do not enter into this decomposition, and remain in the mother liquors. Simultaneously with the bicarbonate of soda an equivalent quantity of chloride of ammonium is formed as mother liquor, from which the bicarbonate of soda is separated by filtration. By applying heat to this mother liquor the carbonate of ammonia is distilled off, and also the volatile sulphide of ammonium, which may also exist in the mother liquors, and these products are collected to be used again.

After the volatile compounds of ammonium have been driven off, burnt or slaked lime is put into the still, thereby producing ammoniacal gas, which is employed in the purification of illuminating gas.

Instead of dissolving the chloride of sodium in solutions of carbonate of ammonia, as above described, concentrated or strong solutions of these salts may be made separately, then mixed together, and carbonic acid injected into the mixture. Instead of water, the mother liquor containing chloride of ammonium and chloride of sodium may be used for washing the illuminating gas in the towers, and caused to absorb fresh quantities of carbonate of ammonia therefrom. The liquor may then be employed for dissolving fresh quantities of chloride of sodium, and further quantities of bicarbonate of soda are manufactured from it. The above operation may be repeated once, twice, or as often as may be found convenient. It is not necessary to use the mother liquor for washing the coal gas, but if it has been used for this purpose, and its use is discontinued, the liquid which contained principally chloride of ammonium is then treated as above described.

As the ammonia derived from the coal gas itself is constantly added to that which is introduced into the circulation by this process, the quantity accumulated in excess of the quantity required for the purpose of purification is conducted into sulphuric acid or hydrochloric acid for the manufacture of commercial salts of ammonium. The chloride of calcium formed by the action of the burnt lime on the chloride of ammonium may be either utilized in any convenient manner, or discharged as refuse matter. The bicarbonate of soda obtained is heated in closed vessels, to deprive it of one equivalent of carbonic acid, which, being unmixable with other gases, is collected in a gasholder, and forced therefrom, by means of suitable pumps, into the mixture of carbonate of ammonia and chloride of sodium, as above described. As an auxiliary source of carbonic acid, that obtained by heating bicarbonate of potash or soda is used, after these bicarbonates have been produced from the carbonates by means of impure carbonic acid obtained from known sources.

The use of ammoniacal gas or liquid ammonia has been already proposed for the purification of illuminating gas from carbonic acid, but in every instance the proposed method of its application has involved the use of slacked lime in connection with ordinary gas liquor, and therefore insoluble carbonate of lime has been produced. This product has proved a more formidable nuisance and a more disagreeable residue to dispose of than that obtained from the dry lime purifiers now used, a fact which has hitherto prevented the application of this otherwise effective process of purification. In all these processes, moreover, the carbonic acid in the ammoniacal liquor (which, in its soluble form, represents a certain value) has been not only lost, but has actually been converted into a source of annoyance.

One object of this invention is to obviate these difficulties by utilizing the carbonic acid, without producing any solid refuse, as the chloride of calcium may be run into sewers or rivers, in which it will act as a disinfectant. A part of the chloride of ammonium liquor may also be decomposed by sulphide of barium instead of by lime. If this decomposition is effected with heat in a closed boiler, sulphide of ammonium is volatilized, and may be condensed in acid, or otherwise utilized, and chloride of barium obtained at the same time. By passing sulphurous acid through this sulphide of ammonium, hyposulphite of ammonia is produced (if the temperature of the liquor be kept down sufficiently), which hyposulphite may be decomposed by sulphuric acid, and the sulphurous acid set free may either be conducted into leaden acid chambers, or used for the purification of gas obtained from sulphide of hydrogen. If the sulphide of ammonium is conducted at once into acid, the sulphide of hydrogen is burnt into sulphurous acid, and the latter is passed through sulphide of barium solutions for the production of hyposulphite of baryta.

Solutions of sulphide of barium are also employed for the purification of gas, either—first, for depriving the same simultaneously of its carbonic acid, and of the sulphide or bisulphide of carbon contained therein; or, secondly, for freeing it from the sulphide or bisulphide of carbon only after the carbonic acid and other impurities have been previously removed by other means.

For the elimination of the sulphide or bisulphide of carbon by this process the presence of sulphide of ammonium with the sulphide of barium is essential, as it induces the formation of sulphocyanide of barium by the assistance of heat. For this purpose the illuminating gas is passed in either a number of purifying tanks, or in suitable scrubbers through the solution of sulphides, as often as is found necessary, and the solutions are used either cold or heated. In this process, as used for the elimination of both the carbonic acid and the sulphide, or the sulphide of carbon, carbonate of baryta and sulphide of ammonium are obtained, which is separated by decantation, filtration, and distillation. In the use of this process for elimination of the sulphide or bisulphide of carbon only, the sulphide of ammonium is distilled off from the sulphocyanides, and the residual liquor containing the latter is used several times over for dissolving fresh quantities of sulphide of barium, in order to accumulate



the sulphocyanide of barium formed therein during the process of purification of the gas. When the compound has sufficiently accumulated in the liquor it is separated, by any convenient process, for the manufacture of prussiate of baryta or prussiate of potash.

After the illuminating gas has been freed, in the first set of towers or scrubbers, of its carbonic acid by means of ammoniacal gas or liquor, and in the second set of its bisulphide of carbon, it is purified from the sulphide of hydrogen contained therein, by admitting sulphurous acid gas derived from the decomposition of hyposulphite of baryta by means of hydrochloric acid; the sulphur thereby set free is collected and used, after it has been washed and fused, as in the recovery of sulphur from alkali waste. Each set or series of the towers is worked by itself, the last one or two towers of each set being used for washing; and water, mother liquor, or weak liquor, being used separately therefor. The gas, however, passes through all of the towers in an uninterrupted current.

241.—COTTERELL, F. J., Birmingham, "An improvement or improvements in sliding gaseliers or gas chandeliers." Patent dated Jan. 26, 1877.

This invention has for its object to turn off the gas from the gaselier or gas chandelier, by the raising of the sliding part or body to its full extent, that is, by raising it into the position in which it is usually brought when out of use, so that in case of the falling of the sliding part by the breaking of the chains or weights by which the gaselier is balanced, there is no escape of gas.

This object is effected in the following manner:—In the gas-pipe, commonly called the down pipe, which is connected to the ceiling, and which conveys gas to the sliding part or body of the gaselier, is fixed a tap or stopcock, situated immediately below the pulley frame over which the chains of the balance-weights work. The plug of this stopcock is provided with an arm, lever, or handle, projecting from the down pipe, the end of which may be hooked or have a loop upon it. When the stopcock is open, and gas is permitted to pass through the down pipe to the sliding body of the gaselier, the arm, lever, or handle being horizontal, or at right angles to the down pipe; but when the arm, lever, or handle of the stopcock is turned so as to place it vertical or parallel with the down pipe, the stopcock is closed, and the gas is cut off from the sliding part of the gaselier. The closing of the stopcock is effected by the raising of the sliding part of the gaselier; that is to say, when the sliding part of the gaselier is raised to its full extent on the down pipe, the top of the water cup of the sliding part striking against the projecting horizontal arm or handle of the stopcock below the pulley frame, turns the handle and closes the stopcock. The gas is thus cut off from the sliding part of the gaselier, and in case the latter should fall, there is no escape of gas. When it is required to use the gaselier it is only necessary to bring the projecting handle of the stopcock into a horizontal position, to re-open it and permit of the gas passing to the sliding part of the gaselier. The opening of the stopcock may be conveniently effected by a hood rod being engaged with the looped or hooked handle of the stopcock, or by a small lever attached to the water cup. A chain or cord is attached to this lever, and by pulling it the lever is engaged with the arm of the stopcock.

422.—KIRKHAM, T. N., Westminster; HULETT, D., High Holborn; and CHANDLER, S. and J. C., Newington Causeway, London, "Improvements in apparatus for the purification of gas." Patent dated Feb. 1, 1877.

This invention has for its object improvements in apparatus for the purification of gas, and relates more particularly to an improved washer or scrubber for the purpose of condensing, washing, and purifying gas, air, or vapour. It consists in the employment of a vessel of cylindrical or other convenient form, placed either horizontally or vertically, and into it is fitted a shaft working in bearings or stuffing-boxes. Attached to this shaft is a series of concentric tubes, leaving sufficient space between for the gas to pass through. This shaft may be made to revolve or not, as may be required. The tubes may be made of plain or perforated metal, wood, or other suitable material, or woven wire may be used.

The patentees do not bind themselves to concentric tubes, as the same object can be attained by using sets of tubes attached to the shaft, with spaces between for the gas to pass, or by a volute, or by louvres placed either horizontally or vertically.

The action of the apparatus is as follows:—The whole of the concentric tubes, volutes, louvres, or their equivalents, attached to a shaft, are caused to revolve by means of steam or other power, and the vessel being charged with water or other liquid to the required height, the whole of the tubes become wetted, and the gas, air, or vapour having to pass through the spaces on its way to the outlet, comes into contact with them.

431.—POPE, J., Folkestone, "Improvements in taps or cocks, which improvements are also applicable to regulating the flow of water to water-closets and other like receptacles." Patent dated Feb. 1, 1877.

This invention consists essentially in the employment of a conical plug arranged relatively to a seat of corresponding form in the line of flow of the water, and carried by a stem or spindle passing through a gland or stuffing-box to the exterior, in such a manner that, by the act of depressing the stem or spindle, the plug shall be removed from its seat, and the tap or cock thereby opened for the discharge of the water, but that so soon as the hand of the operator is removed, the plug shall be forced to its seat by the pressure of the water, and the tap or cock thus closed, in which position it is maintained by the pressure of the water until again opened by the hand of the operator. If required, a lever may be employed, in order to obtain increased power for operating the plug, and means may be provided for maintaining the tap or cock in its open position without the necessity for the operator retaining his hold of the stem or spindle.

448.—WIGHTMAN, G., Elksley, and ALLEY, S., Glasgow, "Improvements in water-meters." Patent dated Feb. 2, 1877.

The patentees describe and illustrate several modifications of their invention, and they claim—

1. The combination of an intermittently rotating drum with a weighted catch lever, and placed in the upper part of a casing or vessel filled partly with air and partly with water, the parts being arranged and operating substantially as described.

2. The placing of a combined drum and weighted catch lever, or equivalent details, which measure by weighing separate portions of the water in the upper part of a casing in which air is confined under pressure, and from which the water is discharged under pressure.

3. Appliances described for renewing the air in the meter when it is confined under pressure.

4. The constructions or modifications of proportional valve apparatus described.

5. The imparting of rotation to the moveable part of the proportional valve apparatus.

6. The system or mode of proportionally dividing the water passing through the meter by passing it, under equal conditions, through a number of equal holes or slits, one or a small number of which communicate with a passage leading to the measuring details, substantially as described.

487.—MATHER, W., Salford, "Improvements in apparatus to be used in raising water from artesian and other wells." Patent dated Feb. 5, 1877.

This apparatus consists of a bush fixed in the rise-pipes above, or in the

suction-pipes below when pumps are used. The lower end of this bush fits in a bush attached to the upper end of the pipe which collects the water from the bottom of the well. The two bushes are connected, by studs in the one fitting into slots in the other, and the upper bush is surrounded by three or other number of india-rubber or other packing rings, which are expanded by the weight of the rise-pipes, and contract when the weight is removed.

502.—CHATWIN, T., Birmingham, "Improvements in screw wrenches or screw spanners and in gas grips." Patent dated Feb. 6, 1877.

This invention consists of improvements, having for their object the rapid and accurate adjustment of the moveable jaws of screw wrenches or screw spanners and gas grips. These improvements are in part applicable to those kinds of wrenches or spanners commonly called Budding's spanners. In the Budding's spanners the bar of the spanner on which the moveable jaw slides has on its back edge a rack, or a series of inclined teeth, a milled screw, or a wheel working between a fork at the back of the moveable jaw engaging with the rack teeth. By turning the milled screw, or wheel, the moveable jaw may be adjusted the required distance from the fixed jaw at the head of the wrench or spanner.

For the purpose of permitting of the milled screw, or wheel, of the spanner being rapidly thrown into and out of gear with the rack teeth described, it is proposed to construct the parts in the following manner:—The milled screw, or wheel, is mounted upon an axis jointed at one end to the top branch of the fork of the moveable jaw, and capable of turning upon the joint as a lever. The other and free end of the lever axis passes through and works in a slot in the bottom branch of the fork, the projecting end of the lever axis being provided with a short handle, or thumb plate. By passing the thumb plate of the lever axis outwards—that is, from the back edge of the bar—the lever axis takes an inclined position, and withdraws or unengages the milled screw, or wheel, from the rack teeth. The moveable jaw is now at liberty to be moved by a sliding motion on the bar, so as to rapidly adjust it at the required distance from the fixed jaw. On removing the pressure from the thumb plate end of the lever axis a spring in the slot in the lower branch of the fork, bearing against the lever axis, presses it into its normal position and re-engages the milled screw, or wheel, with the rack teeth, and by now turning the milled screw, or wheel, the fine adjustment of the moveable jaw may be effected.

The improvements described in Budding's spanners may also be applied to the adjustment of the moveable jaws of gas grips.

The invention consists further of the following improvements in screw wrenches or spanners:—Instead of a milled screw, or wheel, for engaging with the rack teeth on the back edge of the wrench, or spanner, a sliding bolt is used, working in a slot at the back of the moveable jaw. The front of this bolt is made into rack teeth corresponding with the rack teeth on the back edge of the bar. The toothed bolt is worked by a lever pressed outwards by a spring, so as to press the sliding bolt into gear with the rack teeth on the bar. By pressing the thumb plate end of the lever inwards, or towards the back of the bar, the sliding toothed bolt is moved outwards, and disengaged from the rack teeth on the back of the bar, and the moveable jaw is released, and may be adjusted nearer to, or further from, the fixed jaw by sliding it on the bar. After the adjustment of the moveable jaw the lever of the sliding bolt is released, when the bolt is pressed inwards, and its toothed end made to engage with the rack teeth on the bar, and fix the moveable jaw in its adjusted position.

For the purpose of obtaining a finer adjustment of the moveable jaw than that afforded by the last described arrangement, two independent sliding bolts and levers, situated side by side, may be employed. In this arrangement the teeth of the toothed ends of the sliding bolts are not situated opposite one another, but the bases of the teeth on one bolt are situated equidistant between the bases of the teeth on the adjacent bolt, the distance between a tooth on one bolt, and the next tooth on the adjacent bolt being equal to one-half the length of a tooth on the back edge of the bar of the spanner. The result of this differential arrangement of the teeth of the sliding bolts is that by pressing alternately one or other of the levers, a fine adjustment of the moveable jaw, equal to the length of half a tooth, may be effected. When it is required to completely disengage the moveable jaw from the bar, for sliding it on the bar, both levers are simultaneously pressed so as to withdraw both bolts from the rack teeth.

552.—BENNET, H., and BOSTOCK, I., Rugeley, "Improvements in pumps." Patent dated Feb. 9, 1877.

This invention consists, first, in attaching to the bottom of the suction-pipe or pipes of the pump a semi-circular or turned-up pipe, terminating in a hollow pierced or perforated bulb or rose; and, secondly, in placing in the course of the suction-pipe or pipes of the pump, and at a considerable height above the level of the water to be lifted, a trap or pipe having a double bend in combination with an air vessel.

601.—NAWROCKI, G. W. von, Berlin, "Improvements in water-meters." A communication. Patent dated Feb. 14, 1877.

This invention is not described apart from the drawings.

635.—CLAYTON, L. and L., Hunslet, "An improved mode of and apparatus for punching metal plates to be used as gasholder top sheets." Patent dated Feb. 15, 1877.

This invention consists of an improved arrangement and apparatus for punching sheets or plates for plating gasholder tops, by which means the plates can be punched and prepared without the aid of a template, and punching the holes one at a time, as is usually the case.

The row of holes near the edge at each side of a plate is first punched at one stroke or one time (the punches radiating to the centre) with a punching machine prepared for that purpose, whereby any number of holes can be punched at one time, providing the punch bar and die bed are long enough. After the plates are punched at each side it is necessary for the ends to be truly punched to fit the adjoining plates or sheets accurately at both ends, which are of a segmental or curved form, more or less, according to the circle the sheets are to make. This is done by means of punches and dies fixed in their beds and sockets, and made to the proper segment or curve forming the circle they are for, which beds and sockets are made the full length of the ends of the sheets or plates they have to punch. By this method the plates or sheets are punched with great accuracy, making those in the same row or circle exact duplicates of each other; the bottoms of the sheets are also punched so as to exactly coincide with the tops of the sheets joining to them.

The distance of the holes can be varied in pitch, and an ordinary punching machine prepared for the purpose can be used in punching the sheets or plates. The punches and dies can be fixed in any convenient way, so that the curves are truly formed. The plates for the whole of a gasholder top (either of convex or flat shape) can be punched before being fixed in their places, thus saving an immense amount of labour, and at the same time obtaining great accuracy.

640.—HADDAN, H. J., Strand, "Improvements in apparatus for cutting pipes, columns, shafts, and such like." A communication. Patent dated Feb. 16, 1877.

These improvements consist in the combination of a divided sleeve, having



a centring device, with a jointed revolving collar and cutter head, carrying a cutting tool actuated substantially for the purposes of embracing and cutting pipes, columns, shafts, and such like, of metal or other material, in their places without removal or otherwise. The sleeve is made to surround and to be affixed to the pipe or article to be cut, and is divided longitudinally into two parts or semi-cylinders. The two parts may be united by lugs and bolts, or by a hinge and lugs and bolts. The pipe is centred in the sleeve by means of radial set screws, and the collar is divided into two sections, works in the sleeve, and holds an adjustable cutter head.

641.—REGINALD, R., Hull, "An improved adjusting pipe-tongs." Patent dated Feb. 16, 1877.

These improved tongs consist of two arms moving upon a centre-pin close to one end, somewhat similar to the ordinary pipe or smith's tongs, in which the clasp of the hand upon the double arms is particularly advantageous in giving a very secure grip upon the pipe. In this invention, however, the centre-pin is placed through an open fork in the one arm, and in the middle of this fork the pin is swelled out to form a boss, which is drilled and tapped with a fine thread. The other arm is screwed into this tapped boss. The two arms will thus open and close similar to the ordinary tongs, but one of them can rotate on its own axis in the swivel boss, and by reason of the screw thread tapped therein, it will lengthen or shorten the under jaw by rotation from left to right, or from right to left respectively. This enables the width of the jaw to be altered to suit a variety of different sized pipes. The end of the fixed arm terminates in a bent hook to clasp the pipe, but the end of the under moveable or adjustable jaw terminates in a flat toothed face, which seizes the surface of the pipe with its serrated teeth and prevents slipping.

642.—WALKER, W., Scholes, "Improvements in rings for joints for steam, water, gas, or air." Provisional protection only obtained. Dated Feb. 16, 1877.

This improvement consists in a ring of circular or any other required form composed of cotton or other fibre, rubber, either pure or a compound, and wire.

Hitherto joints for man-holes, valve-chest facings, cylinder lids, or other joints, have been made from india-rubber, cotton, pure or compounded, and moulded to the shape required, thus preventing their use for any other shape than that for which they were made.

The improved ring consists of india-rubber, compounded or otherwise with cotton, flax, or other fibrous material, wrapped round a ring of wire jointed or otherwise; this ring of wire when complete forms the centre of the ring, and is of sufficient strength and flexibility to preserve the ring in its first form, or to allow of the same being bent to any other desirable shape, retaining such shape.

Another advantage of the improved ring in joint-making is, that in case the ring is not sufficiently screwed or tightened, it does not blow the ring past the bolts; the centre wire preserving its form.

657.—GREEN, C. H., Old Broad Street, London, "Improvements in the arrangement and construction of gas-stoves and utensils to be used therewith, and for other purposes." A communication. Patent dated Feb. 17, 1877.

This invention relates to the manufacture of a stove having gas as a fuel, and which can be used either as a cooking or heating stove; and also to appliances which can be used either with gas or other stoves for cooking and heating purposes.

A casing is made, preferably of cast iron, larger at the bottom than at the top, and from one to two feet in height as may seem best. A rim may be placed and fastened to the bottom part of the casing, so as to diminish the danger of its being upset. An ordinary gas supply-pipe is inserted through the side of the casing, and at the centre of the inside of the casing another pipe is joined to the one mentioned above, and which passes upward to near the top of the casing and is there fastened. A perforated plate is placed across the inside of the casing near the top, and is covered with a radially corrugated concave cap, which forms a mixing chamber and air inlet that does not interfere with the regular flow of the gas, the corrugated plate containing channels to conduct the gas to the burning point. A rim is placed and fastened to the top of the stove, for the purpose of supporting a heating drum, or cooking utensils; a metal plate is also placed centrally within the casing, and immediately below the orifice of the supply-pipe.

687.—RUSSELL, W., and WILSON, R., Croydon, "Improvements in locks or fastenings for securing the lids to the bodies of gas syphon-boxes, and other similar cases or coverings." Provisional protection only obtained. Dated Feb. 20, 1877.

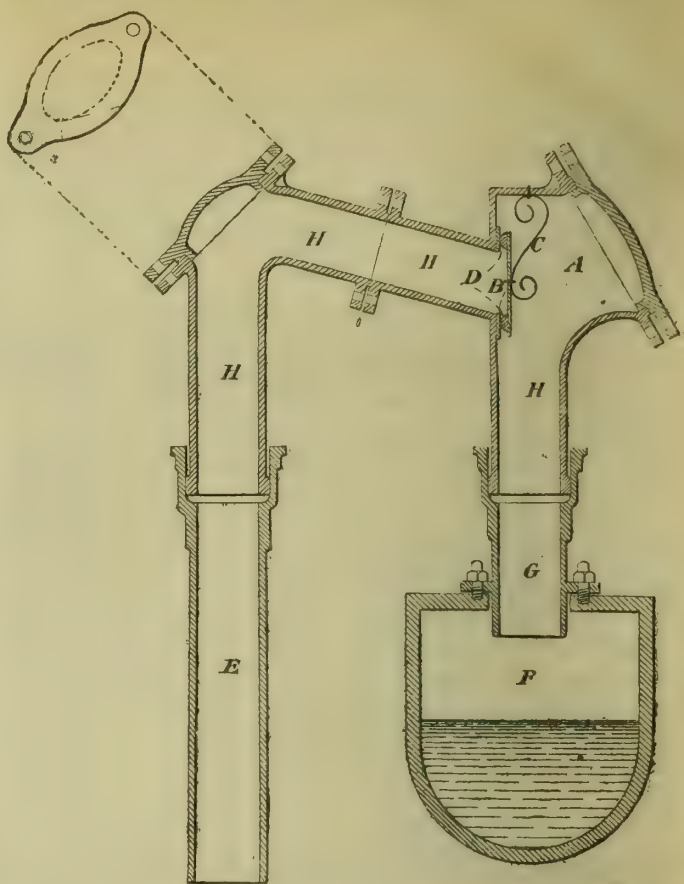
This invention has for its object the production of a secure and more convenient fastening for the lids or covers of gas syphon-boxes, street hydrant-boxes, public light meter-boxes, the lids of boxes placed in the street and used to obtain access to telegraph wires, the ventilators of sewers, the doors covering the entrance thereto, and for other similar purposes.

The invention consists in forming on the under-side of the lid or cover a flat circular boss, having through its centre, and that of the lid, a hole which serves for a key-way. This hole is circular, but has on two opposite sides an indent cut to receive the feathers of a key. Beneath the boss is a moveable piece of metal or bolt, having two arms, with a key-way in the centre, of the same size and shape as that before described. On each of two sides of the key-way is a concentric slot, and through each of these slots passes a flat-headed screw so as to secure the moveable piece of metal or bolt to the boss before mentioned, but not so tightly but that it may be turned round by the application of a key, which is made of the shape and size to fit the keyhole loosely. On each of two sides of the syphon-box is cast a recess, into which the ends of the two arms of the bolt may enter; or, in lieu thereof, there may be cast or fixed two small lugs or studs, having their bottom surfaces inclined to the horizon, but in opposite directions. When the lid or cover is placed on the box, the key is inserted in the keyhole, and passes through the boss into the moveable piece of metal or bolt, and, on being turned, causes the arms either to enter the recesses mentioned, or to press against the under-sides of the lugs or studs before alluded to; and, in consequence of these studs having their under-surfaces inclined, the lid is held firmly in position, and cannot be removed without the aid of the key. In either of these arrangements, when the lid is closed, the removal of the key locks the lid; consequently, no lid can remain in its place unfastened.

663.—NEWMAN, J., and DUESBURY, W., Litchurch, "Improvements in apparatus for transmitting gas from the retorts to the hydraulic main." Patent dated Feb. 17, 1877.

This invention has for its object improvements in apparatus for transmitting gas from the retorts to the hydraulic main.

The gas from the retort is at present conveyed into the hydraulic main by a pipe dipping into the liquor contained in the main; so that the gas has to force its way through the liquor. This invention is to obviate this, by so constructing the pipe hereafter described, which forms the



NEWMAN AND DUESBURY'S "IMPROVEMENTS IN APPARATUS FOR TRANSMITTING GAS FROM THE RETORTS TO THE HYDRAULIC MAIN."

connection (with the pipe G) between the ascension-pipe and the hydraulic main that it will contain a chamber.

In the annexed drawing, the pipe, H, H, H, which forms the connection between the ascension-pipe, E, and the hydraulic main, F, is constructed in two parts, one part so that it will contain the chamber A, for the purpose of allowing the clack and spring to work. In this chamber are placed a clack and spring, marked B and C, also a smooth face-plate, marked D, for the bed of clack, which will open when carbonizing coal, and instantly close against all back pressure. G is the dip-pipe connecting the pipe, H, with the hydraulic main, F.

The gas will be delivered into the hydraulic main, F, free from any seal or dip, thus removing all hydraulic pressure from the retorts, and thereby lessening the formation of carbon on the retorts, and giving an increased yield of gas from the coal carbonized. The effect will also be to carbonize the coal in less time, and to lengthen the durability of the retorts.

The apparatus, being self-acting, removes the absolute necessity for exhausters or engines.

688.—HUNT, C., Birmingham, "Improvements in gas-meters." Patent dated Feb. 20, 1877.

This invention has for its object the construction of meters in such a manner as to admit of their being worked at an increased pressure, and beyond their normal speed without affecting the accuracy of the registration and the steadiness of the lights.

The invention consists—

1. In either removing the division-plate between the front or float-chamber and the drum-chamber, or by making a communication between the two by one or more holes above the water line, so that the inlet gas passes at once from the inlet-pipe into the drum-chamber, and enters the drum by the slits in the hoods. The measured gas finds its way into the hollow cover, and leaves the drum by the bent tube or spout on its way to the general outlet of the meter, which may be placed either at the side or top of the apparatus; in other words, the gas passes through the drum in the opposite direction to that ordinarily the case.

2. In dividing the front or float-chamber into two portions, the inner one being in communication with the drum-chamber, and the outer one serving as a water reservoir. Attached to the upright spindle of the meter is an eccentric, or cam, which causes a spoon to rise and fall, and at each elevation to lift a small quantity of water, and deposit it in that portion of the front chamber which is in communication with the drum-chamber. By these means the correct water level is constantly maintained. The float-chamber has also a transverse partition reaching up to the top of the float, but having a small opening near the bottom of the division, so as to allow of a communication for the water between it and the other portion from which it is divided. The object of this partition is to prevent any alteration of the level of the float by a sudden influx of water. There is also a waste-water box below the previously described front chamber, into which the bottom of the outlet conduit passes, and dips into a seal cup, so as to prevent the extraction of unregistered gas by pricking the outer case.

Fig. 1 is a front elevation of the meter, with the front plate of the square box or float chamber removed; and Fig. 2 is a transverse or side sectional elevation.

In these, A is the outer case of the meter; B, the inlet-pipe for the gas; C, the float, which is free to rise and fall in the float-chamber, D. This chamber is divided from the rest of the outer chamber by the partition, E, but this partition is not essential. The gas having passed into the body of the meter finds its way through an opening or openings in the case above the water-line, as at W, into the drum, F, by the slits in the hoods at the back, and from thence through the drum to the hollow cover, G. Here it descends by the spout or bent tube, H, and either passes up the tube, I, into the conduit, J, and so on to the outlet, K, at the top of the meter, or when the outlet is placed at the side of the meter the gas, instead of going by way of the conduit, J, flows through the pipe, L, to the outlet, M. If thought desirable, the gas may be conveyed from the pipe, I, to the outlet, M, by an alternative pipe or conduit, shown by dotted lines, and marked X. N is the filling-pipe, or pipe by which the meter is charged with



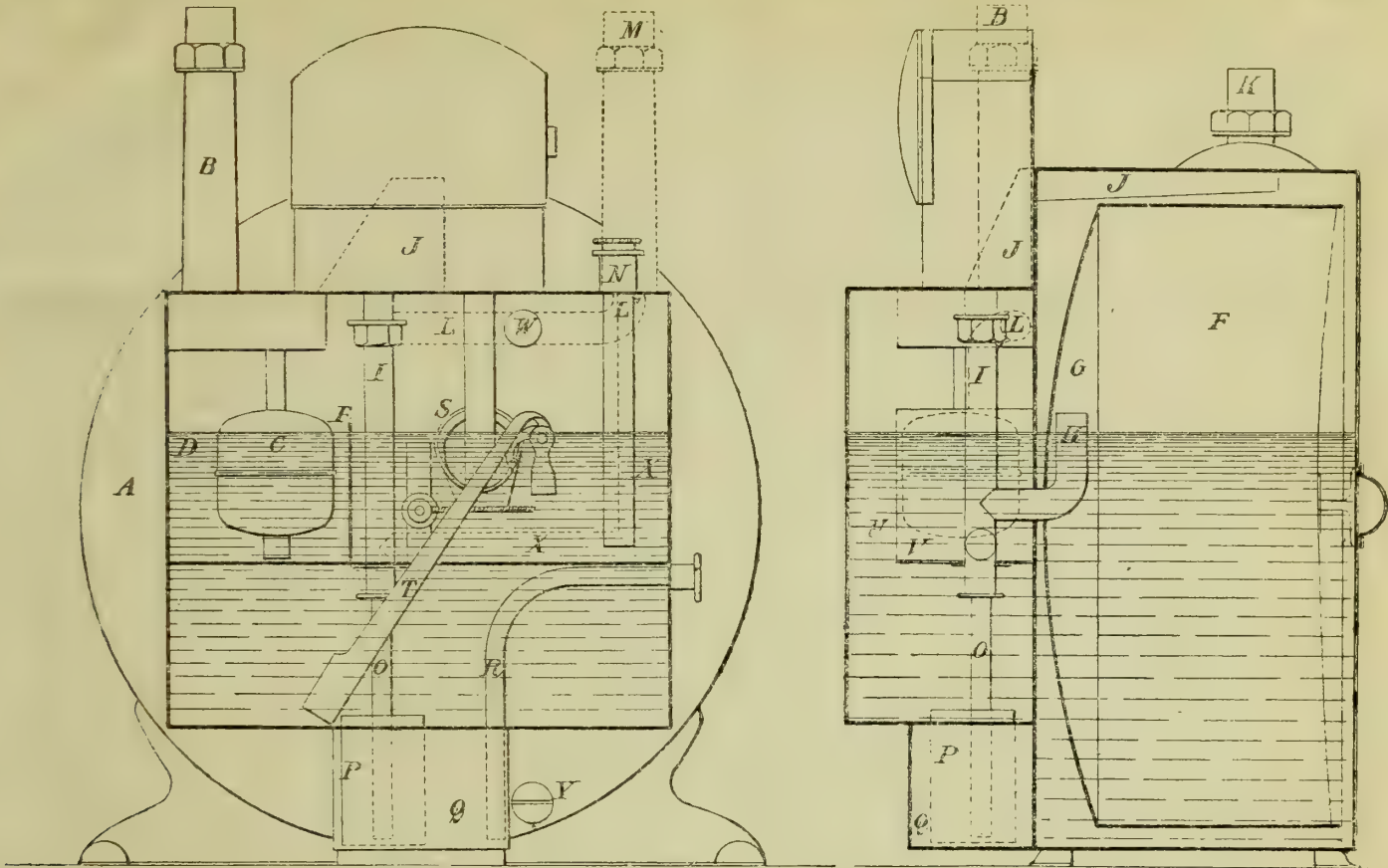


FIG. 1.

FIG. 2.

HUNT'S "IMPROVEMENTS IN GAS-METERS."

water; O is a pipe for carrying off any water that may accidentally get into the spout, and so lead it to a well or seal cup, P, placed within the waste-water box, Q; and R is a pipe for drawing off any accumulation of water within the waste-water box. S is the cam attached to the upright spindle; and T, the spoon lever, which on being raised lifts water from the water reservoir, U, and pours it into the chamber, V, which is in communication with the measuring chamber. Y is an opening provided with a screw-plug for emptying the meter.

The arrangement whereby the gas is driven through the meter in an

opposite direction to that ordinarily done is not new, neither is the arrangement for maintaining a constant water level in the manner described new; but the combination of the two, as described, is new, and constitutes the present invention, whereby a more accurate measurement of the gas and greater steadiness of lights are ensured.

705.—LIVESEY, G. T., South Metropolitan Gas-Works, Old Kent Road, Surrey, "Improvements in apparatus used in the purification of gas."

Patent dated Feb. 21, 1877.

This invention has reference to the improvement of that class of vessel

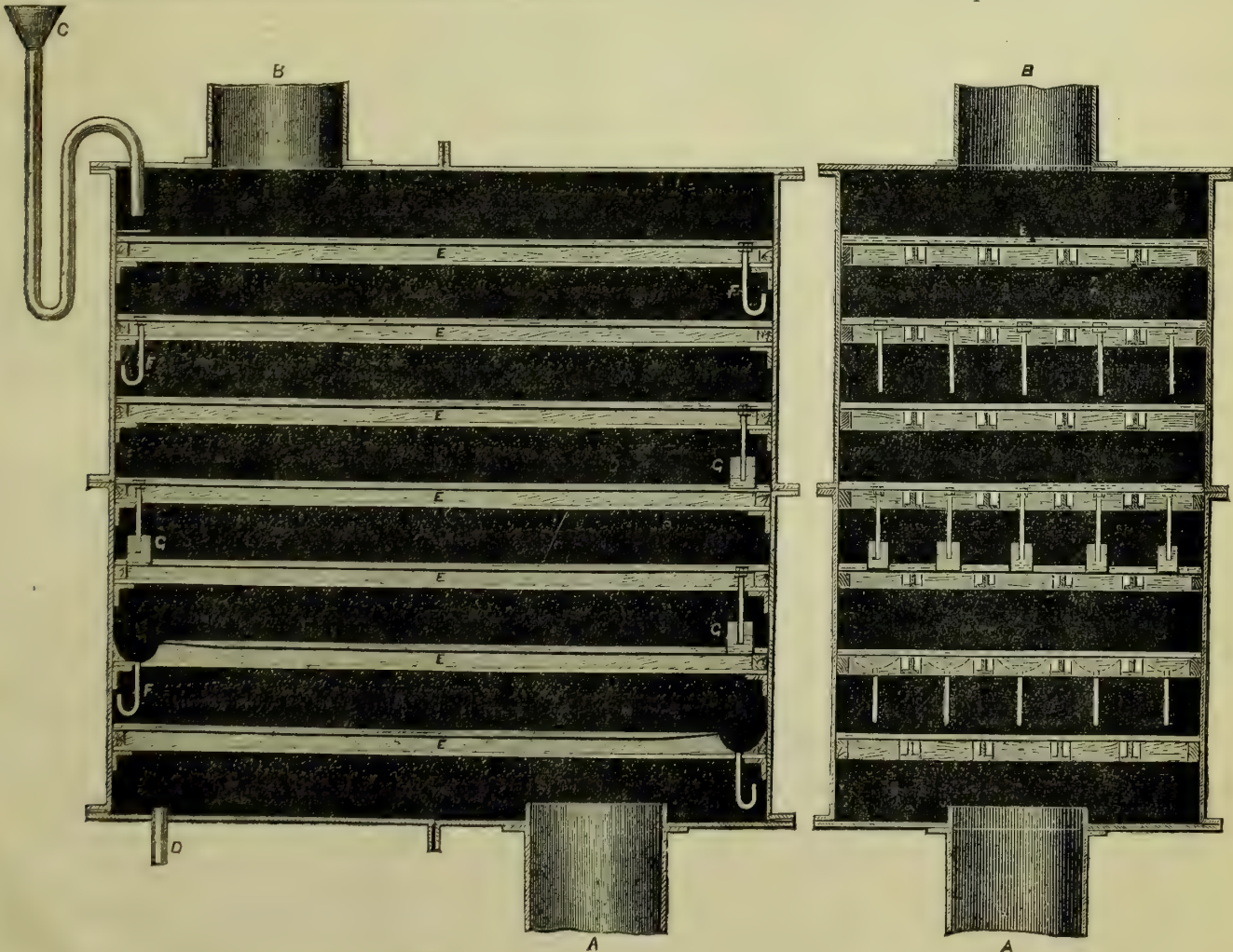


FIG. 1.

FIG. 2.

LIVESEY'S "IMPROVEMENTS IN APPARATUS USED IN THE PURIFICATION OF GAS."



known as "washers," and has for its object the arrangement of the apparatus in such a manner as to render it more efficient for the abstraction of tar, ammonia, carbonic acid, and sulphuretted hydrogen, and cheaper in construction than in those generally employed.

The invention consists of a rectangular, circular, or other conveniently shaped vessel or case, covered both at top and bottom, and divided into a number of compartments by a series of horizontal discs or plates of metal perforated with a great number of holes, say of about 1-16th of an inch, more or less, in diameter. These discs or plates are fastened to the sides of the case, the joints being made water-tight. From one end or side of each plate or disc there is a tube which passes through, rises about half an inch (more or less) above it, and descends to within about an inch of the next lower disc, plate, tray, or sieve, where it dips into a larger tube or cup closed at the bottom, so as to seal the descending pipe when the apparatus is supplied with liquid; or the descending pipe may be curved like an inverted syphon, and so seal the passage.

With the view of providing even greater facilities for the free passage of the water or liquid from one tray to that next below it, than that afforded by the dip-pipes or tubes before described, it may be desirable to make these conduits extend the whole width of the vessel, and by slightly raising one end of the perforated plate forming the disc or tray about half an inch, more or less, and attaching to the raised edge a piece of plain sheet iron, which descends into a seal cup or trough on the next lower tray, a more efficient channel will be provided. By making the liquid conduits in this manner, a more convenient passage is afforded for the tar, and its possible accumulation on the trays is prevented. The case is provided with an inlet for gas at or near the bottom, and an outlet at or near the top. A pipe is also furnished for the delivery of liquid at or near the top, and an outlet for the same at or near the bottom.

In order that the foregoing may be more easily understood, drawings are attached of which the following is a description:—

Fig 1 is a front sectional elevation and fig 2 is an end sectional elevation. In fig. 1, E, E, show the perforated plates, trays, or sieves, screwed or otherwise fastened to wooden bearers, which are supported by T-iron bearers, these T-iron bearers being turned down at their ends, and bolted to the case. C is the water or liquid inlet, beneath which is a dash-plate to break the force of the liquid in its delivery. F, F, are the tubes for conveying the overflow liquid from one tray to another, and may be either curved or straight. In the latter case they are each surrounded by a seal cup, G. It will be seen that the three lower perforated plates are bent up, as before described, the overflow conduit being formed as shown, the bottom edge of the vertical plates dipping into seal troughs. A is the inlet for the gas, and B the outlet for the same, while D is the outlet for the liquid.

The action of the apparatus is as follows:—Water or other suitable liquid is delivered in a continuous stream from the supply-pipe into the vessel. Gas is also admitted from the inlet. The liquid falls upon the first perforated tray or disc, and would pass through it, and descend like falling rain, but is prevented by the ascending column of gas, which passes through the holes in the disc, and then forces its way through the half-inch stratum of liquid, the liquid being broken up and converted into froth by the gas in its endeavour to pass to the outlet. The liquid flows off from the top of each tray by the small tubes, or by the larger openings before described, into the seal cup or trough, which it overflows, and then falls on to the next lower tray. The same action takes place in each of the divisions or compartments before described.

It will be seen that although pure water may be admitted above, the result of its contact with streams of gas, so numerous as to convert them into bubbles, is to change the liquid into strong ammoniacal liquor, combined with other impurities, by the time it reaches the bottom, while the gas is at the same time subjected to a more thorough and efficient washing, in consequence of the innumerable particles into which it is broken up, and in consequence of the gas in its passage upwards coming into contact with weaker liquor, until in the top tray it meets with pure water only.

The invention is not limited to the number of trays arranged as described, nor is it confined to the application of these trays to vessels specially made to contain them, since they may be applied to existing vessel or parts of vessels.

In order to ensure the perfect action of the apparatus, it is essential that the perforations in the plates should not be too large. It is stated that they should be about 1-16th of an inch in diameter, but the size may be modified in proportion to the depth of the stratum of liquid on the plates, and also to the quantity and pressure of the gas admitted.

Washers made with perforated trays, which cause the liquid to descend like showers of rain within the vessel, are not new, but washers with trays having perforations of such a size, and arranged so as to produce the before-described effect, are new. In the former case the liquid passes in drops through the gas, whereas in the latter the gas passes in bubbles through the liquid.

706.—JACKSON, W. M., Providence, U.S.A., "*Improvements in gas-stoves.*" Patent dated Feb. 21, 1877.

This invention consists in the new method for burning hydrocarbon gas, or the ordinary gas supplied in cities, by first heating the gas and then mixing the heated gas with air, thus supplying the proper quantity of oxygen required for the perfect combustion of the gas throughout the whole mass, and not, as is usually the case, in streams or layers, without the required atomic mixture.

The invention further consists in the peculiar construction of a stove or burner, in which a closed retort or heating chamber is provided, which, being surrounded by the burning flame, and connected with the gas inlet, and also with the outlet, heats and expands the gas before the air is mixed with the same.

726.—JOHNSON, S., Wood Green, and BURTON, R., Clerkenwell, "*Improvements in gas-meters.*" Patent dated Feb. 22, 1877.

This invention consists of improved methods of constructing and arranging the parts of wet meters, by which the height or level of the water in the measuring chamber is adjusted; also of a method of supplying and retaining a sufficient quantity of water in the overflow-box through which any surplus water in the meter passes. The meter is thus rendered capable of being regulated from outside without disturbing any of its fixed parts, and greater cheapness of construction is attained than in wet gas-meters as heretofore ordinarily constructed and used. Within the square front of the meter (which serves as a reservoir for the supply of water to the measuring chamber, in the method well understood and practised in the construction of wet gas-meters) is arranged a vertical pipe or chamber, of any suitable shape and dimensions, but preferably circular in plan, and the upper end of this vertical chamber is made open, and rising nearly to the top of the square front or reservoir. The lower end of the vertical chamber is made closed, and provided a connecting-pipe, which forms a communication between the inlet gas-pipe of the meter and an opening in the bottom of the vertical chamber described, and a communication is also made between the lowest part of the connecting-pipe described, and the waste-water box below the square front or reservoir.

727.—BUCHHOLZ, J. A. A., Hammersmith, "*Improvements in the manufacture of gas for lighting purposes, and in machinery or apparatus connected therewith.*" Patent dated Feb. 22, 1877.

The object of this invention is to feed the gas-producing material into the

retort continuously, and not in periodical charges, as has hitherto been the practice, the continuous feed being particularly desirable, if not indispensable, when the material referred to is at all of a bulky nature, such as maize, rice husks, or other ligneous substances.

The apparatus is so designed that, for the purpose of forming the joint where the feed and delivery take place, the specific gravity of the gases is brought into play, as well as the resistance to percolation offered by the loose aggregators of the material to be converted, and that of the coke, while the pressure under which this resistance operates is regulated through the exhaustor and throttle-valve, in conjunction with the regulator, by the pressure developed inside the retort, and the natural and constant atmospheric pressure outside.

748.—STOVE, A. S., Lerwick, "*Improvements in the manufacture of gas, and in the apparatus or means employed therefor.*" Provisional protection only obtained. Dated Feb. 23, 1877.

This invention has reference to a new or improved construction of water-luted escape valve or trap for allowing the free outlet passage of illuminating gas, as produced in the retorts, to the gas main or pipe leading to the purifiers or gasholders, instead of the usual hydraulic main and curved or bent pipe at the top of the retort, drawing, stand, or ascension pipe, and which dips into the water and tar of the hydraulic main. This improved valve, it is considered, will be more safe and convenient, and easier kept clean, than the appliances heretofore employed for a similar purpose. The nature and novelty of the invention consist in fitting a large close annular or trap-shaped valve-chest at the top of the gas ascension escape-pipe of each retort, having the upper end of the pipe projecting up in it some distance above the lower edge of the side branch for the escape of the gas from the upper part of the chest. Water is always kept in the lower annular part, into which the lower open mouth or lip of an arched or domed light metal automatic valve or stopper works over the upper projecting end of the escape-pipe, and guided by a light central rod projecting and working loosely up through a hood or sleeve formed or fitted gas-tight on the close top or cover of the chest.

765.—BOULTON, M. P. W., Tew Park, Oxford, "*Improvements in apparatus for producing heat by the combustion of inflammable gases or vapours.*" Patent dated Feb. 24, 1877.

This invention consists in the combination of an annular gas jet with a mixing passage of varying sectional area, and in admitting a regulated supply of air to both the interior and the exterior of such annular jet of mixed gas and air, and in the modified construction of burner of the kind referred to, wherein the air and gas supply orifices are governed by connected valves.

795.—DENNIS, T. H. P., Chelmsford, Essex, "*Certain improvements in water-waste preventers.*" Provisional protection only obtained. Dated Feb. 27, 1877.

This invention consists of further improvements on an invention for which letters patent were granted to present inventor, No. 431, dated Feb. 3, 1874.

This invention is for the purpose of flushing water-closets, urinals, or other purposes, where the quantity drawn or discharged is required to be limited, and the further improvements consist in the addition of a box or container affixed to the short leg of the syphon, and by reversing the action of the plunger, and making it fit into the box or container so as to be acted upon, by a lever and pull, by a lifting instead of a plunging motion.

796.—MILNES, J., Milnesbridge, near Huddersfield, "*Improvements in the construction of plug-taps and valves for water, gas, steam, and other purposes.*" Patent dated Feb. 27, 1877.

This invention consists in making the body of the tap larger in diameter than is in ordinary use for common taps, and filling the same with a plug, metal to metal. The openings through the body of the tap that the connecting-pipes are coupled to, are not placed opposite to each other, but are arranged so that the bottom of the orifice or hole on one side of the tap is above the top of the orifice on the other side of the tap. The orifices or holes in the plug correspond with the holes through the body, and are formed of such a size that there is no curtailment or contraction of area through the tap, but that there is the same area through the tap as in the pipes. When the plug is turned to close the orifices of the tap, the openings in the plug are opposite to the blank parts of the body, which are at different heights. By these means the distance between the openings at each side of the tap are increased, and this decreases the liability of leakage in consequence of the increased distance the fluid or gas has to travel round the plug between the orifices.

The second part of the invention consists of a loose seating for the class of valve commonly known as the mushroom wheel screw-valve, which are commonly made with a seat forming part of the valve body, so that when the same leaks, through the defectiveness of the seating, which is of common occurrence, the valve has to be detached from its position, and reground or refaced in the lathe, while by adopting these improvements, a new seating can be replaced at once without removing the valve, all such seatings being made duplicate, so that the same will fit any valve of the same diameter.

#### APPLICATIONS FOR LETTERS PATENT.

2376.—HAMMOND, J., Lewes, Sussex, "*An improved method of and apparatus for the complete purification of coal gas by concentrated liquid ammonia, and the recovery of sulphur and ammonia, for the manufacture of sulphuric acid and sulphate of ammonia.*" June 14, 1878.

2389.—WIRTE, F., Frankfort-on-the-Maine, Germany, "*Improvements in the method of and apparatus for the manufacture of tar.*" A communication. June 15, 1878.

2397.—LAKE, W. R., Southampton Buildings, London, "*Improvements in apparatus for carburetted gas.*" A communication. June 15, 1878.

2399.—THOMPSON, W. P., Liverpool, "*Improvements in and appertaining to the obtaining of light by means of electricity, and in apparatus therefor.*" A communication. June 17, 1878.

2401.—DUROS, C., Paris, "*Improvements in apparatus for producing electric light.*" June 17, 1878.

2440.—SUGG, W. T., Westminster, "*Improvements in counterbalances for gasholders.*" A communication. June 19, 1878.

2451.—FRANZINI, M. M., Naples, Italy, "*An improved apparatus for lighting purposes.*" June 20, 1878.

2461.—JOHNSON, J. R., Red Lion Square, London, "*Improvements in means or apparatus for measuring liquids.*" June 20, 1878.

#### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

4816.—HEWIT, J. M., Edinburgh, "*Improvements in sliding pendants for burning gas, paraffin, or other oils.*" Dec. 18, 1877.

35.—BEAN, E. C., Southsea, and HARRIES, B., Landport, Southampton, "*Improvements in the means of and in apparatus for flushing and after-flushing water-closets, and to prevent waste of water.*" Jan. 2, 1878.

39.—BENSON, M., Southampton Buildings, London, "*Improvements in pipe-joints for containing liquids, gases, and air, but more especially applicable to gas and water mains.*" A communication. Jan. 3, 1878.























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